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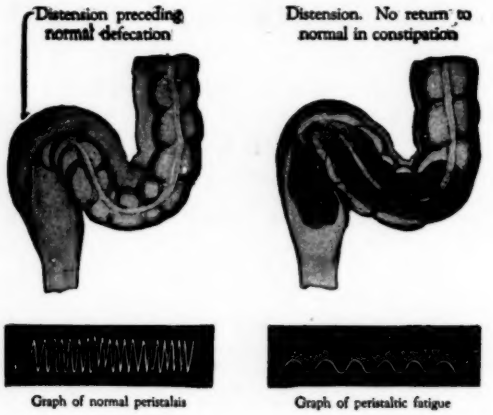
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Medical Times

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The Etiology and Prevention of Pneumonia

CHARLES D. LEVEIN, M.D.,

Brooklyn

The mortality of most infectious diseases has shown a definite decrease in the last half century. The death-rate of pneumonia, on the contrary, has shown almost as definite an increase. This is so the world over. A summary of the returns of the annual reports of the Registrar General of England and Wales on the mortality of pneumonia as compared with that of typhoid and tuberculosis, reflects typically this situation. The table below gives the mortality per million.

Years included	Typhoid	Tuberculosis	Pneumonia
1861-1870.....	300	2,590	990
1871-1880.....	321	2,231	937
1881-1890.....	199	1,850	1,034
1891-1900.....	179	1,418	1,214
1901-1910.....	91	1,143	1,254
1910-1920.....	90	996	1,271

In the United States the mortality is still higher. The U. S. A. Public Health Report for the last five years shows mortality from all pneumonias to average 1,500 per million. The incidence of the disease can only be estimated from the mortality figures. However, the available facts, with no resort to speculation, suffice to stamp pneumonia as a great public problem. Proof of the awakening of all civilized nations to this fact is seen in the hundreds of commissions appointed in the last decade for the study and investigation of this disease.

Reviewing the literature generally, before deciding from which angle to discuss this problem, I was impressed by the emphasis placed on the treatment of the disease. There is no question as to the importance of this phase of the matter, but I doubt that the goal of truly scientific medicine is merely the treatment of an illness. The great accomplishments of the past have been chiefly preventive in character. We had quinin for malaria before Ross discovered the role of the mosquito in the dissemination of that disease, but it was only when the true mode of transmission was understood, that malaria was controlled. Medicine has made most remarkable progress in the last fifty years. It has solved problems which have baffled humanity for ages and ages in the course of a very few years. This, can be readily explained by the fact, that it was during this period that the role of micro-organisms in disease was first discovered. Once the profession was armed with this knowledge, it adopted a different attitude toward every medical problem. The era of prophylaxis came into being. The movement is still in its infancy, and yet, it has already spread throughout the world and accomplished wonders. It is in this movement that the control of pneumonia lies.

Pasteur said that it is possible to eradicate all diseases of bacterial origin, but that first one must know the bacterial agent responsible, and record the means by which it establishes itself in the human body. Superficially, one would think that if the above statement were true, pneumonia should have been eradicated long ago. But in the case of pneumonia, the thing which retarded progress was the paradoxical fact that a large proportion of normal individuals may constantly harbor in their mouth sceretions, organisms, apparently identical with those causing the disease. Until 1917, it was therefore thought, that autoinfection played the chief role. As a result, little was done in the field of preventive medicine. Since the discovery of the existence of several types of pneumococci, however, an almost feverish wave of activity manifested itself in all parts of the world. A tremendous amount of work was done to fathom the full significance of this discovery.

In the pages that follow, I have attempted to summarize what is known about the cause, and the possibilities of the application of such knowledge, in the prevention, of pneumonia.

To clarify the plan I intend to follow, I have outlined, in a way, the order of presentation.

Etiology

A—The pneumococcus
- I—Historical review
- II—Frequency of occurrences in cases
- III—Facts about the pneumococcus
  - 1—Morphology
  - 2—Cultural peculiarity
  - 3—Detection
  - 4—Variation of virulence
  - 5—Toxin formation
  - 6—Types of pneumococci
- IV—Distribution in normal throats
- V—Constancy of types
- VI—Interpretation of above data

B—How the pneumococcus establishes itself in the body
- I—Sources of infection of
  - 1—Type I and Type II pneumonias
  - 2—Type II and Type IV pneumonias
- II—The routes of invasion
  - 1—From source to victim
  - 2—From focus of infection to lungs
    - x—Aspiration
    - y—Lymphatic route
    - z—Blood stream invasion

C—Factors influencing the occurrence and spread of pneumonia
- I—Geographical distribution
- II—Climate and season
- III—Sex
- IV—Age
- V—Overcrowding
- VI—Race
- VII—Toxic agents (alcohol)

Prevention of Pneumonia

A—General preventive measures
- I—History
- II—Discussion of measures
  - a—Public education, legal intervention
  - b—Isolation precautions
  - c—Duties of attendants
  - d—Problem of carriers
- III—Importance of individual hygiene

B—Specific measures
- I—Vaccination in animals
- II—Vaccination in man
  - a—Wright's work
  - b—Lister's work
  - c—Cecil and Austin
  - d—Cecil and Vaughen, etc.
- III—Conclusions

I—What is the Cause of Pneumonia?

Hippocrates was confronted with this question and his reply that it was "a derangement of the spiritual restoring essence" was as good as any for a score of centuries to follow. For, although the clinical and pathological aspects of the disease were fairly well understood hundreds of years ago, it is less than fifty years since its infectious nature was first suspected. The frequent and apparent incongruity between the local lesion and the severity of the systemic manifestations of pneumonia led von Jurgensen to suspect an infectious agent,—even prior to the era of bacteriology. However, once the knowledge of the role of microbes in disease became general, many workers, independently, isolated the responsible organism. Thus in 1880, Sternberg isolated an encapsulated diplococcus from his own sputum. Pasteur made a similar discovery in the saliva of a child. Talamon, in 1884, isolated from the pulmonary exudate of a case a similar organism. This he succeeded in growing. Injection of the culture produced a fatal septicemia in animals. Frankel was the first to show the constant presence of the microbes in the sputum of patients. He described the pathogenic and biologic characteristics of the germ and gave it the name by which it is now known.

Weichselbaum confirmed the findings of Frankel and identified the pneumococcus in the blood and tissues of a large series of cases of pneumonia. His work was almost conclusive in proving the etiological relationship of the organism. But Koch's "postulates for establishing the pathogenic character of a specific microbe" were not yet truly fulfilled. The typical pneumonia of the human was as yet not produced experimentally. In 1888, Gamaleia, working in Pasteur's laboratory, produced a reaction in sheep and dogs which was very similar to true pneumonia. It was not until 1920 that true pneumonia was produced experimentally in monkeys by Cecil and Blake. These workers found that intratracheal injections were alone successful.

II—How Often is the Pneumococcus the Responsible Organism?

In about 95 per cent of the cases diagnosed as lobar pneumonia, the organism predominating and isoltable is the penumococcus.

Evidence: In a series of 1,500 cases reported by Lister, the pneumococcus was isolated in 95 per cent from the sputum, blood or lung (by puncture). In a positive long puncture, 99 per cent of cases showed pneumococci.

Glynn & Digby collected about 2,000 cases of lobar pn. and report 90-95 per cent with pneumococci as the predomoinating organism in the sputum.

III—Facts About the Pneumococcus

1. The morphology is distinctive and at the present time there is no question as to the individuality of the organism.

2. The cultural characteristics are important. Its sensitivity to slight variations in reaction of the media is used by one school to explain the death of the organisms at the crisis.

3. Malone considers the best single test for the pneumococcus to be their bile solubility. Usually more than one criterion is used.

4. Virulence of this microbe is vary variable. It is increased by passage through animals and attenuated by prolonged artificial cultivation. Moreover, the virulence varies for different hosts.

5. Toxin formation of the true soluble type has not been demonstrated. Autolysates of the cocci are, however, hemolytic and toxic. The endotoxin present is thermolabile, removed by filtration through a Berkefeld filter, and by tryptic digestion. Kraus, found in 1897, a soluble substance in the cell-free fluid of young cultures. This he was able to specifically precipitate and demonstrate in vitro. In 1917 Dochez and Avery were able to repeat the work of Kraus and succeeded in demonstrating the substance in the blood and urine of patients.

6. Neufeld and Handel were the first workers to demonstrate the existence of varieties of pneumococci distinguished on an immunological basis. They selected the most pathogenic strains from typical cases lobar pneumonia. With these they immunized horses and donkeys by means of graded intravenous injections. Using the protective action of the antisera they developed, they discovered two main types. Their work was of momentous importance, for it was the incentive for the investigations which followed. In 1913, three years after the above paper was reported, Dochez and Gillepsie in America and Lister in South Africa, published independently, treaties on a serological classification of pneumonias. The American grouping and Lister's were compared and it was found that Types I, I, III, corresponded to strains C, B, E. Lister's Group A falls in the heterogenous American Type IV. Urquhart obtained strains from Lister and found similar types in

England. Thomsen and Christensen found the pneumococci in Denmark fell into the same classification. Sacquepee, working in France obtained similar results. Thus this vital fact was gradually realized everywhere, namely, that in all future work pneumonias must be classified according to the type of pneumococcus responsible. Since typing was not universally done, the distribution of types in cases must be determined from the reports of individual workers.

(a) In North America and Europe the distribution of the types is roughly similar. Averaging the results of workers in the United States, I obtained a total of 2,466 cases of lobar pneumonia that were typed. These showed 33 per cent of cases to belong to the Type I group. There were 22.8 per cent in the regular class of Type II, and 3.4 per cent in the sub-group of Type II. In 11.6 per cent the infection was due to the Type III cocci. There were 28.4 per cent Type IV pneumococci active in the group collected. The differences found in England were merely a larger proportion of Type IV infection. In Northwest Europe Type III infections were rare, comprising only 0.8 per cent of the total infections. The largest single, individual report was that of Larsen and Cecil, and their results agree remarkably with the average of all the reports considered.

(b) In South Africa, Lister reported the results of the typing of several hundred cases. Here 61 per cent of the cases were of our Type IV. There is a special strain of this type known as Strain "A," which was responsible for 31 per cent of all cases.

(c) Malone, in 1923, reported his findings in India. Roughly they were as follows: Type I, 28 per cent; Type II, 17 per cent, Type II, 8 per cent, Type IV, 47 per cent. These differences depend on the place, race, class and time. Thus in an investigation by King of these factors as to their influence on the types of pneumonia, he found, briefly the following: In rural districts the type, usually showing a greater predominance over the average percentage for that strain, is the Type IV. Cities show a greater proportion of the fixed types. He finds, as do practically all other workers, that a Type III infection is the most severe and the Type IV least severe. King also shows that a greater proportion of Type IV cases occurs among Indian soldiers than among the camp followers. He finds that a high proportion of the fixed types is so frequently under conditions of poor hygiene that he has actually employed the proportion of these fixed types as an index of defective hygiene.

IV—The Distribution of the Pneumococci in Normal Throats is Significant

Stillman studied the saliva of 942 healthy individuals. (He included, however, some who had been in contact with pneumonia cases.) In 47 per cent, one or more types were isolated. His results may be summarized as follows: Type I, 7 per cent, Type II, 4 per cent; Sub-type II, 15 per cent; Type III, 17 per cent, Type IV, 56 per cent. Dochez and Avery examined the throats of 485 normal people who had not been in contact with any cases of pneumonia. They found 43.5 per cent of the saliva examined positive. They had the following distribution: Type I, 2 per cent; Type II, 4 per cent; Type III, 16 per cent; Type IV, 78 per cent. With the above work as a control, the investigators examined in a similar manner the saliva of contacts. In this series the proportion of Types I and II rose to 25 per cent!

Meyer cultured on plates the material obtained by a naso-pharyngeal swab of 100 non-contacts. He did his work in the summer of 1920, and found only 21 per cent positive. There were no Type I or II. In the sub-group of Type II he found 4.8 per cent, Type III 14 per cent, Type IV 81.2 per cent. In a series of 113 non-contacts which Dochez and Avery examined in the winter of 1918, 58 per cent were positive. The distribution of types also differed from the results obtained by Meyer. They were as follows: I, 4.5 per cent; II, 12 per cent, III, 0.0 per cent, IV, 83.5 per cent. This seems to indicate a varying incidence for different seasons of the year .

V—The Determination of the Constancy of Type is Essential before any Deductions Can Be Drawn from the Distribution of the Types in Health or Disease

Cole followed several hundred races of pneumococci for three years, transferring them from plate to plate and from animal to animal and he found them always to breed true in regard to the type.

Miss Stryker grew pneumococci on homologous serum. A great change occurred "almost a type-change." The degree and stability of the change varied with the time of growth. She was able to obtain the original type after animal passage.

In the Ministry of Health Reports for 1922, an apparent mutation of a Type IV to a Type I is reported after animal passage. Clough also reports a similar mutation.

Rosenau reported, in 1914, mutations on single organism isolations of hemolytic strep. to Type III pneumococci. He also described numerous other mutations. These were never reproduced and hence do not receive much credence.

There is a mass of work done mostly by Cole and Moore, Kolmer and Weiss, and Steinfeld, on the type specificity as determined by various serological tests. As is well known, agglutination of all types occurs with a univalent serum used in different degrees of dilution. The reaction to an intradermal injection of dissolved pneumococci after previous sensitization is not type specific. The antihemolytic reactions of immune sera are not type specific. Cole found that even complement fixation is not absolutely type specific.

On the other hand, Chickering found that only homologous sera will protect mice. Also, the curative effect of the Type I serum has no action in any of the other group infections.

This subject is not definitely settled. Even if it were certain that no mutations are possible in vitro, there is no evidence but that they may occur in vivo. This possibility is suggested by the disappearance of the type of pneumococcus present at the height of the disease, in the convalescence, of pneumonia. The workers at the Rockefeller Institute were the first to study this feature. They followed about fifty cases in all. The sputum of each case was typed throughout the acute part of the illness and in the convalescent stage until the responsible type was no longer found. They reported also the type present at the time when the original invading type was no longer present. It was found that in 7—90 days after recovery the responsible organism was not insolatable. The average time required for its disappearance was 3—4 weeks. It was usually supplanted by a Type IV, rarely a Type III. If the causative organism was a Type III, it would also disappear. Eastward and Griffith found that by "selective plating" they could follow the gradual diminution of the original invading type with a simultaneous increase of the type which eventually would entirely supplant the responsible organism. They could find no indication of anything suggestive of a transition from one type to the other.

VI—Interpretation of the Work Thus Far Summarized

1. From the frequency of its occurrence in cases, from the experimental proof of its conformation with Koch's rigid postulates, from what is known of its virulence, the pneumococcus may reasonably be accepted as the exciting cause of lobar pneumonia. It may appear superfluous to stress and support a statement which is generally accepted. But there are men, who, aware of all the facts of the case, still question the truth of that statement. Thus, in the *American Journal of Medical Science,* Dr. A. C. Abbott, of the U. of P., discusses the question: "Is the Pneumococcus Responsible for Pneumonia." He mentions the hog-cholera bacillus and the influenza bacillus as instances of organisms, which, though present in most of the disease, may be second in importance to a virus which is the true etiological factor. He believes there is a possibility of such being the case in pneumonia. There are many problems in pneumonia that are not understood, and these he uses as levers in his argument. The facts are, however, indisputable, and they point to the pneumococcus as the true cause. There is no evidence, moreover, on which to base the presence of any kind of virus as a responsible factor.

2. From the work on the varieties of strains, one may conclude that there are the four types described, distributed all over the world in approximately the same manner. Of these Types I and II are responsible for 66 per cent of all lobar pneumonias. Types III and IV are found in nearly half of all normal people. The first two types are practically never present in normal months but are found in contacts. From these facts it is apparent that about 66 per cent of pneumonias are surely of exogenous origin, and of the rest the preponderance of evidence points to the possibility that even Type IV pneumonias are due to foreign and not endogenous organisms. One must not forget, however, that the entire discussion depends on the specificity of types, and as is above shown there is much evidence on both sides; convincing evidence on neither. However, since much valuable progress has been made on the assumption of type constancy, it is only reasonable to continue on this assumption until there is definite evidence to the contrary. Thus it may be said that Pasteur's first requirement in the control of a bacterial disease has been fulfilled in the case of pneumonia.

B—How the Pneumococcus Establishes Itself in the Human Body

1. If we knew just how the cocci invade the body, Pasteur's second requirement would be fulfilled, and then the eradication of the disease would be comparatively simple. Work done in the last decade indicates quite definitely the possible routes for the Type I and II pneumonias, but merely suggests the paths the other types follow in their spread. Therefore, to consider the first and the last two types separately, would simplify matters.

II. The sources of Type I and II pneumococci are limited, and, to a great extent, these sources have been uncovered. Outside of the body, the viability of the pneumococcus is not great. Wood has shown that the germs exposed to sunlight die in a very few minutes. Still in moist, dark places, the life of the cocci is a question of days. Moreover, Types I and II are practically never found outside the body, save in the vicinity of cases ill with such types or in the quarters of the healthy carriers. Stillman investigated this question. A square foot of the floor of the room to be tested was swept. The dust was mixed with a standard broth. The mixture was injected into a mouse and the type of pneumococcus present was determined. In this manner 62 specimens of dust taken from ordinary rooms were examined. The results were compared with the findings in 109 examinations of quarters of patients ill with pneumonia. In the first, control, series, the results practically coincided with those given above for the findings in normal throats. They were 29 per cent positive for pneumococci.

The specimens of dust from sick-rooms proved 79 per cent positive and gave a distribution of types similar to that found in the sputa of patients. The results can be readily grasped from the table I arranged from Stillman's article. I also included the results of the examinations of the sputa of normal and of the ill for comparison.

Pneumococcus Type	Incidence in Normal Room-Dust	Incidence in Normal Sputum	Incidence in Pneumonic Room-Dust	Incidence in Pneumonic Sputum
I.....	0.5%	2.0%	33.0%	33.3%
II.....	0.0%	4.0%	31.0%	29.3%
IIa.....	0.0%	0.0%	0.0%	0.0%
IIb.....	22.2%	0.0%	2.7%	0.0%
IIx.....	16.6%	0.0%	2.7%	4.2%
III.....	11.0%	16.0%	2.7%	13.0%
IV.....	44.0%	78.0%	27.0%	20.3%

From these tables it is seen that an important source of infection, with Type I and II pneumococci is the dust in the patient's room. The same type was always found in the dust as was responsible for the illness. Growth developed in cultures of dust as long as 16 days after the patient was removed from the source at which it was obtained. As a rule the dust became free of pneumococci sooner than did the saliva of the patient. The life of the germ is remarkably prolonged if it is left in the sputum. It may survive for weeks in the dark in dried sputum. In the prophylaxis this source must be properly handled.

The human sources of infection with Type I and II occi are patients with these types of pneumonias, convalescents from such pneumonias, and persons who have acquired the organisms by intimate contact with patients. That these individuals harbor these germs the investigations cited heretofore prove.

The above discussion included only the Type I and II occi, the case is not so clear as far as the other types of pneumococci are concerned. As was previously indicated, these Types III and IV are demonstrable in about 50 per cent of healthy people. The sources of infection with these types for the remaining 50 per cent, who harbor no pneumococci at all, are the same as for the first two types considered. But the question of autogenous infection arises in the first group who already have the germs within them. The occurrence of such autogenous infection may be due to altered resistance of the host, to enhanced virulence of the micrococcus, or to a combination of the two. This phase will be considered in the pages to follow. At present I wish to emphasize the importance of the sources, above discussed, not only in the dissemination of Type I and II organisms, but also Type III and Type IV pneumococci. First, to repeat what was proven of Type I and Type II cocci. We know these are responsible for over 60 per cent of all cases of pneumonia. Also, we know that practically every case of a Type I or II pneumonia must have become infected from one of the sources mentioned above. Recognition of these facts means that we can control with proper prophylactic measures at least 60 per cent cases. But, that by no means, is the limit of our power. We have seen that 40 per cent of pneumonias, at the very most, are caused by Type III

and Type IV cocci. Since only half of normal people harbor these germs, it may be argued that only half of those 40 per cent pneumonias can possibly be autogenous. Then there will be 80 per cent depending on the sources of infection discussed, for their causation. The remaining 20 per cent of pneumonias are believed to be autogenous only rarely. The case in these is very difficult to prove. Type III and Type IV germs are only superficially understood, especially is there much confusion about the heterogeneous group. As a result the evidence as to the auto-inoculation of these types is conflicting. Be that as it may, the above facts are sufficient to indicate the great significance of the relation of the sources of the pneumococci to the dissemination of infection.

III. Given the source, the next question to answer is as to the route by which the micrococus implants itself in the body. Here again we tread uncertain ground. The germ is either aspirated or is indirectly, through fingers or food, introduced into the pharynx. Very few of those invaded succumb to the disease. The qestion of resistance will be discussed later. Now, it is the route of infection of those who do succumb that we are to discuss. How does the coccus reach the lungs? How is the pneumonia produced? Cecil and others have done a great deal of experimental work on this subject and from this work the following conclusions may be drawn:

1. Bloomfield (quoted by Stillman) found that infection of the upper (supra-laryngeal) respiratory passages alone, does not give pneumonia "Unnatural organisms are quickly removed from these regions."

2. Cecil and Blake found that intravenous and subcutaneous injections of organisms do not produce pneumonia.

3. Infection of the lower respiratory passages, even in minute doses, did cause pneumonia. Cecil says, "Probably this infection must reach as low as the bronchi." Jones and Stillman think that to produce the disease the infection must reach the lung alveoli, unless the injecting needle infects the tracheal lymphatics.

4. The above is, of course, true only for the animals experimented with. There is no evidence that these statements apply to man. The work is important, however, because it enables a better understanding of the factors involved in the invasion. Thus, it was possible to trace the path, in the case of these animals, by which the pneumococcus reach the lung. "There is a pentration of the bronchial or lung epithelium and an infection of the lymphatics. This is followed by infection of lymph nodes near the root of the lung. From these as a focus, an interstitial inflammation spreads outward into the lobes." Such is the description of the invasion experimentally produced.

What the process is in man is still awaiting final decision. The aspiration or inhalation theory is the one generally accepted. There is much evidence to support it. The frequency with which a respiratory infection antedates the onset of pneumonia was noted by Gordon. He found that individuals suffering from colds harbored Type IV pneumococci twice as frequently as did normal people. This was substantiated by Stillman. Taking these facts on the background of the work above cited, proving the sources of pneumococcal infection, it is seen that the inhalation theory is supported by them. The insufflation experiments of Cecil also support aspiration as the most probable route of infection. This aspiration may be direct of infected sputum, dust or air. It may be indirect by extension from the pharynx of pre-existing infection. Such auto-infection probably explains the instances of so-called anaesthesia or aspiration pneumonia. But whether the inhaled pneumococci are drawn directly into the bronchi and thence lead directly to a reaction in the neighboring lung tissue, is yet to be determined. Granted this aerogenous route be primary, it may still be that aspiration of the organism is followed by a more circuitus transportation of the cocci through lymph or blood from the upper respiratory tract to the lung. The fate of carbon particles suggests that the alveloar epithelium might thus be readily penetrated, perhaps by the carrying action of leucocytes, as well as through the lymphatics. Moreover, the idea that a bacteremia may precede pulmonary consolidation has quite a bit of evidence in its support. It is suggested by the finding of positive blood cultures very early in the disease. I could find no true statistics on this point because so few cases are seen early enough, and because so few blood cultures are done in the initial stages. There are, however, isolated reports of many cases showing a positive blood before the actual signs of pulmonary disease appeared. The sudden onset, the chill, the frequent appearance of constitutional symptoms before signs of consolidation, the occasional marked disproportion between the symptoms and the extent of physical involvement, all are suggestive of a preceding bacteremia. This discussion is really becoming too speculative, but there were several cases I had and studied which impressed the possibility of an initial bacteremia in pneumonia so strongly on me that I will take a moment to review the history of one.

The patient, an Italian laborer, Jacomo by name, was brought into the hospital on March 15, 1926, complaining chiefly of cough, rusty sputum, headache and a pain over the right ear. His history indicated that he had always been well until about ten days before admission. At that time he came down with what was diagnosed as grippe. In a few days his right side of the face and right ear became painful. The next thing that happened was a swelling of the right testicle. Then about the seventh day of his illness he developed pain in the chest, cough, rusty sputum, dyspnea and cyanosis. Soon after entrance the patience became delirious. On examination of the chest, a right apical consolidation was found. In this case it appeared to me that one could reasonably assume that at certain times there must have been a bacteremia. It is very unlikely that such widely removed foci as were attacked should be affected without the bacteria using the blood stream. It is then quite probable that the pneumonia might have had its origin in this bacteremia.

Another point which argues for the possibility of an initial blood stream invasion is the occasional occurrence of a primary pneumococcal meningitis or peritonitis, showing that the organism may localize elsewhere than in the lung. The situation may be analagous to the newer idea of that in the case of epidemic cerebrospinal meningitis. If this idea is accepted there remains to be explained the predilection of the pneumococcus for the lung. The resemblance of experimentally produced pneumonia to an anaphylactic reaction suggests the possibility of a pre-existing tissue sensitization. Whatever the true explanation may be the fact remains that positive blood cultures may recur in a case with great frequency, and yet only rarely do metastaic infections of hematogenic origin take place. Thus the possibility of an initial bacteremia in pneumonia is not eliminated by the fact that other evidence of this blood infection, such as localization elsewhere, are lacking. However, this matter is altogether speculative and awaits further study. It may be that an early bacteremia does occur in some cases, that in others invasion is entirely by aspiration.

Yet, if the consolidation in pneumonia were the result of simple extension of the invading organisms along the bronchi, one would expect to find this process extending outward from the hilum. The X-ray has made it possible to detect the exact location and extent of the pulmonary inflammation. What is more important, it enables one to study the evolution and progress of any given lesion. Now, roentgenographic studies by Mason indicate that the consolidation in lobar pneumonia begins as a conical or triangular area of solidification with its base toward the pleural surface of the lung and the apex toward the hilum. This infiltration then spreads to the hilus. Often it does not reach the hilus and this may explain the fact that tubular breathing and bronchophony are sometimes absent in the presence of consolidation. Thus the facts are not in accord with what one would expect if pneumonia were merely an extension of an aspirated infection. It seems more likely that the onset of solidification at the periphery would be easily possible via a blood stream invasion.

I have already raised the question as to why the lungs should so frequently be the seat of localization, even if we do assume an initial bacteremia in the disease. There is no definite reason, properly supported with evidence, that can be given. I have thought the matter over for some time, and concluded that regardless what the cause, it is a very good thing that pneumonia does localize in the lungs. My reasons for this statement are two. First, the lungs are peculiarly adapted to combat the pneumococcus and can do this better than any other tissue in the body. Second, if localization were to occur in some other tissue or organ the result would usually be fatal.

I make these statements and the few that follow with full realization of their speculative nature. There are a few facts at their basis, however, and for the sake of these I beg indulgence.

That the lungs are peculiarly adapted to combat the pneumococcus is the first statement to be proven. But before that can be discussed it is esesntial to indicate how the pneumococcus is resisted by the body. The old idea was that opsonins and bactericidal substances were developed and overcame the invaders. But the absence of increased protection in those recovered from the disease, in spite of an increase in these bodies, negatives their importance. Study of the conditions present at the approach of the crisis, when the resisting forces, fully mustered, are soon to overwhelm the infection, forms the basis of the present conception of the nature of these forces. It is known that the pneumococcus retains its virulence up to the time of the crisis, when it may entirely disappear. As the recovery approaches in a favorable case, the number of viable organisms that can be isolated from sputum, blood or lung (by puncture), diminishes till, during or after the crisis, none at all are found.

Clough has shown that with the approach of the crisis, the only antibodies that increase in significant quantities, are those which promote phagocytosis. He has shown that with the increased phagocytic power of the serum, there is a parallel increase in its power to protect mice against infection with a homologous strain. This is not the universal opinion, but all opinions agree that some combination of antibodies present in the serum is one of the contributing factors in establishing immunity against the pneumococcus. This protective reaction is general, but as the infection is localized in the lung, it is there that the benefit of it should be derived to the largest possible extent. The lungs are well suited from an anatomical and physiological standpoint to bring this about. The alveloi are practically capillary networks on a very fine connective tissue support. The aire spaces funish little compartments where serum, antibodies and phagocytes can rapidly collect from every side and act on the provocative invaders almost as in a test tube outside of the body. And anatomically, the process, being intra-alveolar is on an invaginated surface of the body, and, therefore, in away, outside the body.

It is this thought that led to the development of the chemical explanation of the crisis. For just as the gastro-intestinal tract, which is extrinsic in the same sense as is the respiratory, may have a variety of acid and alkaline reactions in its different parts, so the lung may undergo a change in P.H. in the inflamed portions. Palmer demonstrated a gradual but progressive change of the matter obtained by lung puncture from an alkaline to an acid reaction. As was emphasized above, the pneumococcus ceases to grow if the reaction of the medium exceeds 0.8 per cent. It is therefore possible that a local chemical inhibition of the pneumoccus plays a part in the eventual death of the germs. All this can go on in the lung and yet in the cases of recovery there is no apparent permanent damage done. What is more, during the disease, even in double pneumonia, death is rarely due to direct interference with the function of respiration.

Thus it is seen that the lung is peculiarly adapted not only to resist the infection but to return to a practically normal state after the usually marked changes incident to this resistance.

In these cases where there is a primary localization in the meninges, practically 100 per cent end fatally. A peritonitis of pneumococcal origin is also a very severe illness and usually has a fatal termination. A severe pneumonia with marked toxic symptoms is often seen with little and indefinite pumonary consolidation. Also in the presence of extensive lung involvement, the patient is often quite comfortable. I believe this may be all explained on the basis of the idea I have tried to present, namely, that consolidation may be a local protective reaction to an initial general invasion.

C—Factors Influencing the Occurrence and Spread of Pneumonia

I—Geographical Distribution

Pneumonia occurs in all parts of the world, but is more frequently in some places than in others. It is very rare near the north and south poles. It is quite common in the torrid zone. In the temperate zones pneumonia is very frequent and causes more deaths than any other infectious disease. The type of pneumonia differs only slightly in different parts of the world, the exact variation was mentioned under the types of pneumococci. The significance of this distribution lies in the fluctuations in the temperature of the region concerned. The greater the diurnal variation of the temperature, the greater the frequency of pneumonia.

II—Climate and Season

Norris collected 12,000 cases and found the seasonal variation as expressed in this little table:

In Summer	15%	of	cases	occur
In Autumn	20%	"	"	"
In Winter	30%	"	"	"
In Spring	35%	"	"	"

There are a large number of factors influenced by the changes of the seasons. Which are responsible for the changes in incidence of the disease is still an unsettled question. Netter believes that in winter people tend to remain indoors to a great extent, with a resultant in-

crease in the opportunity for contact infection. In support of the actual existence of greater transference of cocci from person to person during the winter season, is the work of Duval and Lewis. These investigators worked in 1905, before the pneumococci were typed. They report finding pneumococci in 46.6 per cent of normal salivas when examined during the summer months. Using the same technic as before, they found over 80 per cent of normal salivas positive during the winter months.

Studies of the virulence of bacteria have shown that passage through different hosts always enhances the pathogenicity of the given germ. It is very possible that this increased passage of pneumococci in the winter months raises the virulence of some strains to a point where they can produce pneumonia. The greater frequency of upper respiratory infections of all kinds during winter and spring also aids in the dissemination of the pneumococci by the increase in sneezing, coughing and expectoration. These upper repiratory infections may also lower the resistance of those who already harbor pneumococci. Of 4,000 cases investigated for the part played by an initial "cold," Norris found that 18 per cent gave a history of having had a "cold" prior to the pneumonia.

The most important climatic conditions are abrupt changes in temperature and humidity. The exact influence of cold and moisture is poorly understood. Permar speaks of a reflex vasomotor change in the respiratory passages following a chill. He argues that this produces favorable local conditions for infection. He has shown that chilling the body surface of animals is followed by increased bronchial secretion. Yet the fact is that it is not cold nor warmth separately that count. It is the change from one to the other that upsets the vasomotor equilibrium. A change from cold to warmth has as much significance as a change in the opposite direction. Thus polar bears brought south to the zoological gardens invariably die of pneumonia in a few weeks. Similarly, Laplanders who move south always die of pneumonia. On the other hand, all respiratory diseases are very rare among members of Arctic exploratory expeditions.

In recent years there were two epidemics of pneumonia, one occurred during the construction of the Panama Canal, the other in the Rand mining district of South Africa. In a report from Rhodesia, one of the mining centers, the committee investigating the causes of the epidemic, emphasized, among other things, the influence of the changes in climate, on the prevalence of pneumonia. The large proportion of the miners were natives, many of whom were recruited from distant villages. The mountainous topography of this region resulted in great diurnal variations of temperature. The natives were thus exposed to a different climatic environment rather suddenly. The commission collected statistics and found that in those months during which the temperature fluctuations were greatest, the incidence of pneumonia increased. Moreover, they found that the "underground-boys" who were exposed to the additional temperature difference existing below and above the surface, were especially susceptible to infection. Measures passed to avoid sudden exposure to cold were passed and were thought to have played an important role in the control of the situation.

III—Sex

Ordinarily the proportion of pneumonias in the sexes follows the figures given by Norris for 12,000 cases collected from a large variety of sources. He found that 73 per cent of cases occur in males and 27 per cent in females. That this difference of incidence is due to environmental conditions and to different degrees of exposure rather than to any especial susceptibility of males or resistance of females seems certain. In institutions where the two sexes live alike this difference is absent. In childhood the difference is much less marked. Moreover, once women do come down with pneumonia, their mortality is higher than in men. Musser gives the average death rate in men as 19.3 per cent, in women as 26.9 per cent.

IV—Age

Pneumonia occurs at all ages, but is most common between the ages of 12 and 35 years. The determining reason for this distribution appears to depend on the greater activity and resultance chance of exposure in the age group mentioned. At the extremes of life the exposure to infection is usually at a minimum and thus the frequency of infection is low.

V—Crowding

This factor is of extreme importance. As was shown above, the sources of infection in pneumonia are human beings who have had the disease, were in contact with it, or are ill with or the excretions of these individuals in dust, air or any object in their vicinity. Pneumonia is very rare in sparsely inhabited regions. Osler called it the disease of the cities. The factor of overcrowding is the underlying explanation of the influence that most other conditions have upon the occurrence of pneumonia. That may be said of the significance of cold, age sex, race, occupation, location and so on. All these indirectly tend to influence the presence of overcrowding. There has never been an epidemic without this overcrowding being present. In the mining districts of Africa the natives slept in "compounds" where they actually lay one on the other. Until proper quarters were supplied no measures were of any avail in the control of the disease. Vaighan and Palmer reported that pneumonia was nine times as frequent in the army during the World War as it was among civilians of the same age. (The influenza period was excluded.) Of the many contributing factors, the crowding, unavoidable in armies, was considered by these investigators the most important predisposing cause of pneumonia.

VI—Race

The morbidity and mortality are higher in the negro than in the white race. This difference is believed to be due to a lack of an inherited or acquired immunity to pneumonia. The evidence on which the belief is based is the high incidence of the disease among the imported workers at the Panama Canal Zone and in the mines of the Rand, Africa. But even a superficial consideration of the conditions under which these workers were forced to live, reveals that the high incidence of pneumonia among them has more tangible explanation than those regarding immunity. The reports of commissions organized to control the disease show that the negroes were quartered in large wooden structures called compounds. Into these scores of the natives would be herded. The ground served as floor and spitoon at the same time. Food and clothing were of the worst. The hygienic conditions were not. The mortality of these workers became so high, and the mines payed so well, that from an economic standpoint, Sir Almroth Wright was hired to investigate the situation. In 1911 Wright found through the use of his opsonic index that there was nothing to indicate that the epidemic was due to lack of immunity. The concensus of opinion then was that the overcrowding and poor hygienic condition were mainly responsible; correction of these factors brought the epidemic under control.

VII—Toxic Agents

Labor pneumonia has been known to follow the inhalation of various vapors, gases, and the aspiration of fluids of irritating nature. These pneumonias are rare, and are believed to be autogenous. The action of these irritating substances is thought to be mechanical, opening the way for infection. Under this head it may be well to recall the action of dust from the environs of patients ill with pneumonia.

Alcohol is a toxic agent which, experimentally, has been proven to predispose to pneumonia. Stillman exposed mice to an atmosphere containing many virulent pneumococci. A high degree of immunity was thus produced in these animals. When these mice were exposed to alcoholic fumes to the point of intoxication, they were found to have lost their immunity. In man alcohol is an important factor only when taken excessively. The type, however, who do take alcohol in large quantities, are usually more exposed, live an irregular life, and have a low resistance to any infection. Not only is pneumonia more frequent among alcoholics, but it is a very fatal disease with them. They can not react normally to the disease. The temperature is low, there are marked nervous symptoms, the physical findings often fail to reveal consolidations.

The Prevention of Pneumonia

I. Preventive medicine has leaped so prominently into the fore in the past few decades that one thinks of it as a product of modern times. The history of its origin may be traced back to Egypt, thousands of years before Christ. There are papyre from those days in which warnings are given against sex dangers and excesses of all kinds. The sanitary code, which is contained in the Old Testament, is one of the greatest triumphs of sanitary legislation that the world has ever known. In the Middle Ages the world was swept by many severe epidemics, and thus in the Renaissance efforts were made to seek the causes and prevent the recurrence of these outbreaks. Then during the 16th century public medicine was first instituted in Italy, quarantine laws were made; and hygienic measures taken to prevent the further dissemination of disease. In the centuries that followed little progress was made in preventive medicine because there was so little advance in the knowledge of the causes of disease.

When Jenner developed the preventive inoculation small-pox he started a work which taken up by men like Pasteur, Koch, Ehrlich and Lister, established a new era in the history of medicine. The most important outcome of this development was the use of preventive medicine and the reduction of human mortality as the result of the growing control of the infectious and contagious diseases and the development of hygiene and sanitation. Attention was not focused on pneumonia until the success in the control of other outstanding infectious diseases brought the fact into prominence that pneumonia was most often the cause of death of all infectious diseases. As a result commissions were organized all over the world to investigate this problem. The failure to eradicate or to lesesn the incidence of pneumonia has been due in part at least to the failure to recognize its usual mode of dissemination.

In recent years the studies previously described indicated that most often infection results from without due to contact, direct or indirect. This fact has led to the proposal of the following general measures to control the spread of the disease.

II—General Prophylactic Measures

(a) To prevent the spread of pneumonia the same general measures are needed as are helpful in lessening the dissemination of other infectious diseases. The public must be educated, adequate legislation must be had, and the enacted laws must be enforced. The compulsory reporting of each case of pneumonia is the first measure all commissions proposed. This should be done; if only for statistical purposes it would be worth while. For at present there are no accurate reports of the prevalence of pneumonia, they are all based on the mortality statistics. Compulsory notification will also make possible the universal employment of laboratory methods of diagnosis and the investigation if specific forms of treatment.

(b) Each case of pneumonia is a possible focus for the spread of infection, and the measures of isolation employed in other contagious diseases should be instituted. As the respiratory secretions are the chief sources of contagion, they should be carefully collected and burned or disinfected. Sterilization by boiling or with disinfectants of handkerchiefs, bed and body linen, clothing and all utensils before they, are taken out of the room is necessary. We have seen the important of dust in the spread of the disease, therefore, precautions should be taken to prevent its accumulation. The sick room should be cleansed daily with care against spreading of dust. Sunlight and fresh air are essential for the patient and also to hasten the death of any pneumococci in the room.

(c) Attendance should protect themselves from picking up the organisms both for their own safety and that of those they come in contact with. Good personal hygiene and scrupulous care of the mouth and nose through the use of mouth washes, plus the use of a gauze mouth and nose guard, diminishes the danger to a minimum.

(d) The control of carriers, whether they are convalescents or healthy contacts, is important. These, evidently, cannot be isolated. They should be made to realize their position as possible disseminators of the disease. They should be instructed to avoid coughing and sneezing without properly shielding their mouth, to avoid expectoration save into proper containers. All convalescents and all who came in contact with them should be included in this group for one month after the time of their recovery from the disease. The use of mouth washes should be advised as it may hasten the time required for the riddance of the organisms.

III—The Importance of Personal Hygiene Can't Be Over Emphasized

There has never been an epidemic of pneumonia in a well-nourished, well-clothed and well-housed community. There are two factors to treat in the prevention of pneumonia: first the transmission of the organism and second, the susceptibility of the victim. It is very rare for a physician or nurse taking care of many cases of pneumonia to contract the disease. It is not unusual for the scrubwomen to contract the illness. The presence of typhoid in a community is not complimentary to the means of sewage disposal and water supply available. The widespread existence of pneumonia bears a very similar relation to the hygiene of a community. The presence of overcrowding was shown to be an important factor.

Exposure to sudden changes of temperature, undernutrition, fatigue, if widespread in any group means several cases of pneumonia in that group. This was the rule in the army during the war. Often it was necessary to send a division of troops into mud and rain for a prolonged march. In a few days there would develop

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The Classification, Pathology and Treatment of the Chronic Anthropathies*

WALTER BROMBERG, M. D.,
Brooklyn, N. Y.

The Arthritides—A Collective Review

On attempting to read any order or scientific agreement into the present classifications of the arthritides one finds the literature hopelesssly confusing. Clinically the subject of arthritis is regarded and treated in much the same unscientific and general manner as, in the past was lumbago. Belonging rightfuly to the medical clinicians, the arthropathies, because of scientific neglect, have had to go begging into the hands of the orthopedists, where they have more recently received painstaking treatment and careful guardianship.

History of Classification

In the days of early Greek medicine, the knowledge of joint diseases was a general one and the term arthritis sufficed to cover the field. Later during the era of the humoral theory rheumatism was used in the same general way to designate all joint affections, and it is this conception that has helped and is still helping to becloud the situation in the minds of the laity. Rheumatism was thought to be due to 'rheum'—a phlem—which flowed from the brain to the joints all over the body causing the malady.

It was not until the 18th century that the term rheumatism was restricted to any acute joint condition, while arthritis was used for all other conditions of the joint. From this time on, during the 19th century, clinical acuity marked out and named many types of arthritis, which were introduced and retained since then in the literature. As an example of this tendency we note that the term gouty rheumatism was introduced to designate a chronic, non-suppurative joint disease. Rheumatic gout (Fuller) and chronic rheumatic arthritis (Adams) were introduced and used as was primary progressive articular rheumatism (Charcot), rheumatic arthritis (Garrod) and arthritis deformans (Virchow). In this country Goldthwaite (1904) cleared the situation by grouping the chronic arthritides into three classes—atrophic arthritis, hypertrophic osteoarthritis and chronic infectious arthritis. This classification has since been used and accepted generally in this country. In Great Britain Garrod resolved chronic arthropathies into three classes —osteoarthritis, rheumatoid arthritis and the arthritides of infectious disease processes. In other literatures the same multiplicity of names obtains.

The state of affairs is clearly demonstrated when it is noted that atrophic arthritis (Goldthwaite—1905), metabolic osteoarthritis (Nathan—1906), rheumatisme noueux (Trousseau—1868), chronic progressive articular rheumatism (Charcot—1874), arthritis nodosa (Waldman—1902), primary progressive chronic joint rheumatism (Pribam — 1902), arthritis deformans (Baumler—1897) and chronic polyarthritis deformans (Virchow—1871) are terms for the same disease.

From this welter of names and classifications we are able to-day to differentiate sharply some of the joint conditions whose etiology was not so clearly determined in the prelaboratory days. Thus gout has now been defined as a joint disease associated with a disturbance in the purin metabolism, characterized by an increased uric acid content in the blood, and having a fairly characteristic clinical course. So also with acute rheumatic fever. The arthritides secondary to the several infectious processes, as syphilis, tuberculosis, or typhoid fever, are readily distinguishable on the basis of the history, clinical course and reaction to treatment. This group has been previously called the rheumatoids (Gerhardt) and pseudorheumatisms (Bouchard), but they are gradually divided off from this nondescript group as the etiology is determined. There still remain a large group of chronic joint conditions not so clearly defined, that have been analyzed and classified by Barker according to various criteria. It may be of advantage to review this classification here.

Classification

I. Differentiation of chronic arthopathies according to pathology.

This may be made first on the basis of the part of the joint involved,—

a. Panathritis; lesions of the whole joint.
b. Periarthritis; lesions of the soft parts about the joint.
c. Synovitis arthritis villosa; lesions of the synovial membrane and villous processes.
d. Arthritis and osteoarthritis; lesions of the cartilage and bone.

This may be made second, on the basis of the type of lesion found,—

a. Malformations—as arthritis teratologia.
b. Degenerative or metabolic disturbances—arthritis of tabes or syringomyelia.
c. Vascular disturbances—arthritis of hemophilics and of arterio-sclerotics.
d. Inflammatory processes—of which we may have several types; namely:
   1. Alterative processes—as atrophic recession after inflammation.
   2. Exudative processes—as chronic round cell infiltration, chronic purulent and ulcerative processes—due to gonococcus or other pyogenic bacteria.
   3. Productive processes—with the formation of fibrous tissue, cartilage and bone. In the joint capsule this process produces shrinkage, and relaxation of capsule, with softening of bones and absorption of cartilage. The result is first a telescoping and subluxation of the bones with shortening of the member, and later an ankylosis due to obliteration of the joint cavity through pericapsular and synovial fibrosis. In the bones and cartilage this process produces atrophy of cartilage with following exostoses, osteoporosis, hypertrophic spurs and other types of bone calluses. In tuberculosis, leprosy, actinomycoses, syphilis, etc., characteristic pathologic lesions are produced.
   4. Tumors—as sarcoma and enchondroma—which are rare.

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II. Differentiation of chronic arthropathies according to etiology.

This may be made first on the basis of the infective agent when determined,—

a. Where the bacteria have been directly cultured from the lesions.

b. Following an infectious process, even though the bacteria have not been isolated from the joints.

This may be made second, on the basis of mechanical agents,—

a. As the indirect result of axial weight-bearing misalignment causing a good bacterial nidus, or

b. As blood changes from mechanical difficulties causing degeneration—as in arthritis deformans.

III. Differentiation of chronic arthropathies according to clinical characteristics.

This may be made in the case of

a. Gout, on the basis of the history, the symptoms, the physical and laboratory findings, and the typical Xray picture.

b. Neuropathic arthropathies, on the basis of a neurological examination, the absence of pain, marked enlargement of the joint, and the monarticular distribution, the Xray picture showing marked exostoses.

c. Primary hypertrophic osteo-arthropathy (osteo-arthritis and arthritis deformans) on the basis of the monarticular distribution, the lack of progression, the lipping of the bones, the presence of osteophytes and often the history of trauma.

d. Chronic arthritides secondary to infectious processes on the basis of the history and physical findings of a preceding infectious disease, laboratory tests and the search for foci of infection.

e. Primary chronic progressive polyarthritis on the basis of

1. The type with the onset of fever, the polyarticular nature of involvement, the symmetrical distribution to small joints, the fusiform swelling of the terminal phalanges. This type is synonymous with the periarticular type of arthritis deformans and the chronic infectious arthritis of Goldthwaite.

2. The type with insidious onset hitting all finger joints, producing rapid atrophy with ulnar deflection in the hands. This type type corresponds to the atrophic arthritis of Golthwaite.

Both types are characterized by the absence of heart lesions, the persistence and progression of the joint lesions and the possibly infectious origin.

Of the classifications herewith offered, the clinical differentiations appear to me to be the best suited to practical discussion of the subject of chronic arthritis. In the discussion which follows emphasis has been placed on the acute rheumatic fever, primary hypertrophic osteoarthropathy and the primary progressive chronic polyarthritis because of their more common occurrence.

Etiology

The question of etiology of joint conditions is one of paramount importance practically and theoretically. The peculiar resistance to treatment exhibited by chronic arthritides intensifies the importance of prophylaxis, and this can only be accomplished in a scientific way if based on the correct etiology.

There are several general considerations to be noted in the discussion of etiology. The greatest number of cases have their first appreciable onset between the ages of 20 and 40; the onset of 40 per cent of 500 cases of McCrae's series being below 30 years. In this series

21% occurred between 21—30 years
21% " " 30—40 "
20% " " 41—50 "

In this same series most of the cases were women, except in cases of spondylities, where there was a high incidence of male patients. Frequent pregnancies, depressing surroundings, poor personal health, as well as moist climate, seem to exert an influence on the disease.

The researches of the last few years in this field seem to indicate the large role infection and metabolic disturbances play in the causation of joint diseases.

That foci of infection are often effective in causing acute arthritis is conceded by all, but that it is effective in causing chronic arthritis of different clinical types is receiving confirmation from several sources. In a study of 200 cases of arthritis in a nose and throat clinic, by Stauffer, two-thirds were found to have diseased tonsils and 25 per cent were found to have infected sinuses. Of the diseased sinuses, infections of the posterior ethmoid and sphenoid cells were most commonly found with a small percentage of obstructions due to deviations of the septum. The incident of teeth infection was compatively low (10 per cent). Of the acute arthritics 75 per cent had tonsillar and sinus infections. while of the chronic arthritics 75 per cent alone had tonsillar infections. The bacterial reports showed the offending organisms to be streptococci, staphlococci, pneumococci and bacillus proteus. The removal of foci of infection in many chronic cases did no good, because of the already definite pathology present.

The bacterial etiology of acute rheumatic fever is most probably a streptococcus of widely varying reaction. The work of Poynton and Paine indicate that a Diplococcus Rheumatici is at fault; whereas the corroborating work of Rosenow, Billings, Barker and Bloomfield indicate that it is a streptococcus which varies according to its environment. The consensus of opinion at present points to a specific bacteriologic etiology—a streptococcus whose bacterial classification has not as yet been academically determined.

In examining the cases of his series of chronic arthritics, most of the classified as arthritis deformans, McCrae found 91 cases of tonsillitis, 28 cases of influenza, 26 cases of pharyngitis, and 74 cases of Neiserian infection. The infections occurred "shortly before or at the time of onset" of the arthritis. Six cases had infected wounds, 4 cases boils, 6 cases, cystitis, 18 cases, pelvic infection, 10 cases otitis media, 4 cases bronchitis, 8 cases dysentery, 1 case pyonephrosis.

McCrae states it is important to remember that deep seated infections due to streptococci may be present without any surface indications of the diseases process.

The best thought at present in reference to the etiology of chronic arthritis secondary to infectious processes, is that it is a systemic toxemia and bacteraemia with localized joint infections. Infections from the ear, throat, tonsils, teeth, gums, nose, sinuses, eyes, heart valves and myocardium, respiratory organs, pelvic organs in the female, prostate, seminal vesicles, urethra in male, abdominal viscera, and from any of the epidemic infections may be the focus for the dissemination of bacteria and toxins which cause arthritis.

The observations of Persson as to the relation between the etiology of chronic arthritis and gastro-intes-

tinal infections indicate definitely what has been long suspected by some writers. Between 1910 and 1922, 2,973 arthritic cases were studied. In 15 per cent of the cases upper respiratory infections were found, and in 63 per cent of the cases infections of the gastrointestinal tract were discovered while 22 per cent cases are reported to have had both upper and lower "zone" infections. The technique consisted in the determination of the opsonic index by Wright's method as a clue to the type and location of the infecting organism. This was based on the fact that streptococci in different localities provoked different types of immunity; then by ascertaining the immunity of a patient (through opsonic indices) the location of the focus could be stated. Patients were found to show a low resistance to only one type of streptococcus usually. The strains of bacteria tend to become selectively localized after inhabiting a certain focus in the body for any length of time, as shown by Rosenow. In the experience of Persson most of the infections were located in the cecocolon. The lesions were produced apparently after some type of change in the mucous membrance of the intestinal tract; as by trauma or vascular disturbance; by the myriads of pathogenic organisms passed down from upper respiratory foci. It was shown that injection of these electively localized bacteria produced no pathology in their sites of election unless the local blood supply was interfered with.

In addition to the bacterial etiology of arthritis, much work has been done on the physiological pathology of the cause of joint conditions. Pemberton by careful experiments found that local blood changes, consisting of a higher saturation of oxygen in the venus blood, were characteristic of the arthritides. This change is due to decreased blood flow through the capillaries in the joint region. The disturbed relation of oxygen and carbon dioxide denotes a state of lowered metabolism in the local region which favors bacterial growth. This work gives positive experimental confirmation to the clinical observations that lowered resistance due to trauma, cold, etc., favors infection at any joint.

Recently some observations as to the relation between the calcium metabolism and the occurrence of arthritis deformans have been made which tend to show that the calcium content in the blood is higher in this disease than normally. In three cases studied by Mark the average calcium content of the blood was 24 milligrams per 100 c.c., whereas the normal figure is about 10 mg. per 100 c.c. One case was carefully watched and treated by diet intended to bring the calcium content of the blood progressively down to a normal level. This was accompanied by a decrease in the pain and symptomatic relief The disturbed calcium content has been suggested by Forbes to indicate some parathyroid involvement.

In an attempt to confirm the blood calcium findings in arthritis, Horowitz recently analyzed the blood of 14 cases of arthritis deformans. Five of these cases showed high calcium findings, while six more showed findings slightly above normal. The range of findings in the both groups was from 16.2 mg. per 100 cc. blood, to 10.1 mg. He also noted high calcium figures for acute gout, but normal range for chronic gout.

The view that arthritis is basicly dependent on an endocrine disturbance is steadily gaining ground. In Germany much work has been done and Thompson in this country has found evidences of thyroid hyper—and hypofunction in many cases of atrophic arthritis. In the hypertrophic types the dysfunction appeared to be hypothyroidism, which was amendable to glandular therapy. Thus patients were found to have subnormal temperatures, slow pulse, characteristic nail and skin changes, low blood pressure, gain in weight and definite Basal Metabolism Rates at variance with normal. Thus in 145 cases studied, one-half showed normal rates; 38 per cent had rates below normal, while 12 per cent of these cases had rates above normal. The cases were unclassified as to type, but were all chronic arthritides. It may be added that as yet no definite invariable relation has been found existing between groups of arthrites and types of dysfunction.

Llewelyn finds a relation between hypothyroidism in children and acute rheumatism. He notes that goitrous regions have a high percentage of rheumatics; that the disease in such a patient tends towards chronicity; and that salicylate are of no avail unless thyroid extract is also administered. In adults it is seen that hypo-and hyperthyroidism is associated with the incidence of acute rheumatic fever and of rheumatoid arthritis (periarticular type of chronic progressive polyarthritis). In this latter condition the minor characteristics are often displayed in place of the more acute signs of hyperthyroidism—thus Coates and Gordan noted sweating, twitchings, disordered heart action, misapprehension, dermagraphia, flushing of the skin. In a case of hypothyroidism trophic findings, as loss of subcutaneous fat and a glazed appearance of the hair, were observed. The frequent coexistence of Raynaud's disease and tetany with acute rheumatism, both before and after the appearance of the joint condition, suggest strongly the possibly underlying endocrine origin of the arthropathies.

Investigation of the change in sugar tolerance in chronic arthritis—long a clinical observation—showed a decrease in the tolerance, according to Pringle and Miller. They carefully tested 100 cases for sugar tolerance, using the ingestion of 100 grams of glucose in 200 cc. water and taking specimens every half-hour for two and a half hours. The curves obtained showed a decreased tolerance which varied with the amount of arthritis and with the degree of infection in the infective foci. Removal of the foci and treatment of the patient increased the tolerance when the patient was not too heavily infected, or where the condition had not progressed too far. The tolerance showed no change on the administration of salicylates, however.

The importance of blood stasis is emphasized by Pemberton considering the small blood supply to the joints, particularly where the tendons insert. He notes that experimental work has been done proving that fixed tissue (contrasting with the circulating blood) and lymph (synovial fluid) cannot get rid of their carbon dioxide by the pulmonary route, as readily as blood can. These facts show how favorable a joint may become for the location and multiplication of bacteria.

Pathology

The pathology of the chronic arthropathies, outlined in the discussion of classification, varies considerably. The actual changes, depending on the etiological agent and the acuteness of the process are:

First, effusion of a clear fluid, which is negative on bacterial culture usually and which later becomes hemorrhagic and turbid. This is especially found in the periarticular form of primary chronic progressive polyarthritis.

Second, thickening of the synovial membrane, which early is red, injected and swollen, and later thickened due to fibrous tissue formation in the synovia. A further proliferation of the synovia may occur with formation of villous processes and possibly calcerous changes.

Third, cartilage changes, consisting of injection and congestion, with later erosion, fibrillation and disappear-

ance of the cartilage cells. With complete cartilage destruction the bone beneath becomes eburnated.

Fourth, bone changes varying with the types of the disease. In the atrophic type of prim. chr. prog. polyarthritis there is a marked rarefaction of the bones especially near the joints. In the hypertrophic form bony outgrowths of different types, as exostoses or lipping, starting usually at the edges of the cartilages at times extend and involve the ligaments and the cartilages. These nodules are usually irregular in form occurring usually at the knee, hip and spine. There is associated with these changes a rapid muscle atrophy not accountable entirely on the basis of disuse.

In the case of acute rheumatic fever the pathology is due to a widespread invasion of bacterial throughout the body, locating in the valves, muscle and pericardium of the heart, pleural linings, joints and subcutaneous tissues. As these bacteria are seeded into the joints, if the resistance is adequate the bacteria are overcome in the first onslaught and no residual pathology remains. On succeeding attacks if the resistance is broken down pathology results. Primarily, in the acute attack, there is dilatation of the blood vessels with exudation of serum and swelling of the subendothelial membrane of synovia. Later there is necrosis of tissue and consequent scar tissue formation along any part of the synovial membrane. The process may be rapid or slow. The exudation first clear, becomes blood stained and later on fibrinous or leukocytic suspension occurs in it as the process in the secreting synovial membrane becomes more acute. The pathology caused by the toxin of the bacteria causes degenerative lesions in the tubules of the kidney and in the heart muscle.

The pathology of the gouty and neuropathic forms of the chronic arthritides does not concern us here especially. The types secondary to infectious processes vary with the infective agent, but on the whole the inflammatory reactions are those set forth under acute rheutatic fever and early polyarthritic changes.

Symptomatology

Of the primary progressive chronic polyarthritides, the periarticular form is the most commonly observed. In this type cartilage and bone changes are secondary to capsular involvement. The onset may be acute, in many joints or slow, in one joint. This suggests a similarity to acute rheumatic fever, which has been reflected in the name rheumatoid arthritis given it.

Acute Onset. There is a temperature of 100° to 102°F., a high pulse, glandular and splenic enlargement and a polyarthritis with red tender joints. It is important to note that in this case the administrations of salicylates have no effect on the course of the disease.

Gradual Onset. Here thare are no general symptoms, beyond a slight temperature running between 90° and 100°, a high pulse. The temperature runs at slightly elevated point for a long time. The arthritis consists of a swollen painful joint, without redness or swelling. The joints in both forms have a boggy feel and restriction of movement, when the swelling has gone down. The characteristic changes are at the metacarpophalangeal joints with atrophy of the interossei muscles and subsequent subluxation and ulnar deflection of the fingers, the characteristic deformity of the fingers, is a fusiform swelling of the interphalangeal joints due to thickening of the capsule. With rapid atrophy of the hand muscles there results a deformity consisting of flexion of the terminal phalanx with hyperextension of the proximal phalanges, which is quite typical. The temporo-maxillary, the cervical vertebral and the thumb joints are often involved in this type of arthritis. There is a peculiar glossy look to the skin with frequent presence of pigmentation: this is typical when present.

The termination of both of these forms of periarticular may be either atrophic or hypertrophic. The former is rare and consists in gross deformities, subluxations and resorptions of bone, especially in the hands and wrists. The latter is commoner, being found in the older patients usually. It is generally polyarticular, except in the one type called "malum coxae senile." In this latter group, spondylitis with formation of the "poker" spine (Spondylitis deformans) associated with severe pain in the back, thorax, abdomen and a marked sciatica and a kyphosis, and Heberdens' nodes in the phalanges are specially important. Here the general features are not severe, nor is the arhritis so acute. Muscle contractures and atrophy are marked. The Xray picture is quite definite, showing newly laid deposits of lime in the regions affected.

The onset of acute rheumatic fever is typically sudden after a history of exposure to cold, or prolonged exertion, with sore throat, malaise, chilly feelings, muscle pains or weakness. The temperature runs about 100° to 102° for a few days, and there is headache and general febrile symptoms. The joints are typically painful, red, swollen, immobile. There is a fast pulse, thirst, poor appetite and insomnia from pain and a scant high colored urine. In children the heart and nervous system lesions predominate, but in adults the articular lesions are foremost. Often a series of subcutaneous nodules are found, especially in children, occurring at the joints and causing little pain, which have been identified as being due to the rheumatic streptococcus. The arthritis itself is polyarticular, very tender, red and swollen with a variable amount of exudation.

The symptomatology of the chronic arthritides secondary to recognized infectious processes present a polyarticular pathology with swelling, pain, loss of function and redness of the joints. The joint involvement clears up in a few days. There is usually glandular involvement and splenic enlargement. A secondary anemia is noted together with slight temperature, high pulse, loss of weight and insomnia due to the pain.

The symptoms of the gouty and neuropathic types are typical and need not concern us here.

Diagnosis

The points on which a diagnosis of primary progressive chronic polyarthritis and primary hyperthrophic osteoarthropathy are made, are a recurring arthritis with residual changes which clears up slowly, a low fever, the typical location of distribution of joint involvement as the temporomaxillary, phalangeal, etc., and the Xray picture. Often an early diagnosis cannot be made due to its similarity to more acute processes.

The diagnosis of acute rheumatic fever is made on the history of exposure, or a previous tonsillitis, the typical evanescent polyarthritis, the heart lesions, the acid sweats and the reaction to salicylates.

The diagnosis of the gouty type depends on the blood findings, the clinical picture, the history; while the neuropathic type can be diagnosed on the neurological examination, the history and the character of the local lesions.

Treatment

The treatment of the arthropathies has undergone some revision, hand in hand with the recent investigations of etiology in these cases. It is only necessary in this connection to touch upon the treatment of the chronic arthopathies, for it is here that most of the progress has been made.

The most important point in the treatment is the removal of infected foci after a careful search for them. In cases where surgical removal of the foci is impossible it is well to attempt vaccinotherapy. Persson has developed this phase of therapy to a high degree. This author uses as antigens, the specific bacteria responsible for the focus infection in the body of the arthritic, which when injected will stir up an immunity at the site of the secondary (joint) lesion. The manner in which this works has been suggested to be as follows:

The usual production of antibodies about the affected joint is facilitated because some antibodies are formed against the specific bacteria responsible, while they are still in their nidus—the infective focus. The bacterial toxins injected are thought to excite the thyroadrenal centers causing the outpouring of a secretion that increases the oxidation, and hence the metabolism of the body. This results in phagocytosis and amboceptor development, with the building up of a defense against the invading bacteria. In a long continued infective process this causes an exhaustion of the gland secretions, resulting in a deficiency and imbalance of the endocrine system.

Hence this author insists on the administration of glandular extracts in addition to the injection. His technique is to get a history and careful physical examination; then to get the opsonic index which according to the "elective localization" theory indicates the particular organism involved. Then the organism is obtained and injected in one-half c.c. amounts daily, increasing the dose to one c.c. until the ninth day. An opsonic index check is done to see the effect on the antibody formation process. A second course of injections of antigen is given with another checking of the opsonic index; the treatment is continued until the indices approach normal. The average time necessary is 47 days. Additionally, when the opsonic index shows signs of lagging specific gland therapy is indicated. With this routine, Persson reports very good results with his large series of cases.

Of local measures the most important is heat. Pemberton has worked this out experimentally. He uses external heat to the part with an electric bake, running it at 120° for 20 minutes. This has been found to cause a rise in the percentage of oxygen saturation in the peripheral blood supply, with a loss in the alveolar and blood carbon dioxide. The carbon dioxide is lost through the sweat, in addition to other physiological channels, leaving a large amount of alkali in the body. This may result in a positive alkalosis if the treatment is too prolonged. In addition to heat, massage and exercise are recommended for the local area. These increase the local metabolism and hence benefit the "disordered physiology" which is the basis for the diseased process. The administration of arsenic for the accompanying anemia, and of thyroid gland extract bring about an improvement through the stimulation to the general and local metabolism.

In the treatment of chronic arthritis, whether a low sugar tolerance has been determined or not, it is advisable to cut down on the carbohydrate consumption. The reasons advanced are that it will decrease the burden of the already depressed metabolism and will reduce the liklihood of the formation of intestinal toxins. Thus Barker calculates a formula using Woodyatt's ketogenic-antiketogenic ratio. Pemberton recommends cutting down the general diet to the basis of 30 calories per kilo of body weight.

Schmitt and Adams in a recent clinical report show that the restriction of the carbohydrate diet, incident to the treatment of a diabetic, does not seem to influence the arthritis found in diabetic patients. In 500 patients they found an incidence of 10.8 per cent who had a well defined chronic arthritis.

Injection of foreign protein—in the form of sterile milk—in 10 c.c. amounts has been tried in order to stimulate phagocytosis. Proteose mixtures have been used by other workers.

The usual symptomatic measures for pain and orthopedic appliances are used as indicated.

It may be added that Torrey and Klein have used another type of vaccinotherapy in the form of Coley's toxin—a culture of virulent streptococci. This is injected intramuscularly for the acute inflammation, starting with one-quarter minim and increasing by doubling until a reaction occurs, the interval between doses being also increased. A brief local and a body reaction were observed with a rapid amelioration of the symptoms. They report very good results in their series of cases using Coley's toxin in conjunction with removal of foci of infection and vigorous physiotherapy.

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A Case of Syphilis of the Seminal Vesicle

E. R. W. Frank says very few cases of syphilis of the seminal vesicles have been reported. In 1901 a case was reported by Duhol and one by Cohn. Zeissl in 1909 stated that he himself had not seen such a case. A man, aged 54, often had bloody urine. He had had gonorrhea when 30 years of age and 25 years ago several mercurial inunctions for syphilis. He had been given prostatic massage for the bloody urine. In 1910 his reaction to the Wassermann test was negative. In 1917 he married and had a healthy child. Later he suffered from neuralgia and bloody urine without distress, which stopped spontaneously and reappeared. This was the state of the patient in 1919 and 1920. Then he developed cephalic and thoracic pain in the left side of the body. The Wassermann was 4 plus. Bloody urine always came on after pollutions. There were granulating defects in the sphincter muscle which was slightly hypertrophied. In the rectum the seminal vesicle was felt as a tough slight enlargement. Bismuth and sulfoxyl-salvarsan improved the nervous symptoms. Later, baths and mineral water were taken and the Wassermann became negative.—(*Ztschr. f. Urolog.*, 1925, XIX, 415.)

Treatment of General Paralysis and Tabes by Tryparsamide

W. S. Dawson observes that the spirocheticidal action of tryparsamide is relatively feeble, but it has a marked tonic effect; it promotes recovery from toxic injury and induces the healing of syphilitic lesions without increasing the liability to a generalized spread of the spirochete. At the same time it has very little local or general irritant action upon the tissues, and cumulative effects are infrequent. In none of the author's series of twenty cases was there produced any remarkable result such as might not possibly have been obtained by the administration of other arsenic compounds. Several cases of paresis appear to have had their downward course arrested, while others have improved to a lesser extent. Whether tryparsamide is really more potent than are other arsenicals is not proved in the author's series of cases, but the drug is certainly worth further trial.—(*Lancet*, May 23, 1925.)

Precancerous Conditions About the Anus and Rectum

CHARLES J. DRUECK, M.D.,
Chicago.

Nothing positive is known of the actual cause of cancer growth and many of the new theories are but the fanciful expression of older vague ideas. We have certain well established laws governing the normal growth of tissue cells but tumor growth transgresses all these laws.

Cancer tumor is composed of the normal cellular tissues of the host although the relationship in the case under observation may not always be clear because the tumor does not resemble precisely the tissue from which it springs. Normal cells are readily recognized and their relation to one another and to their respective tissues is all so clearly understood that we readily note their reactions to injuries. In cancers we find the cells abnormal in form, and also in relation to one another, and in their relation to the surrounding tissues, as well as in their functions. This disregard of the laws which govern the growth and other activities of normal cells differentiates cancer from normal tissue. Sometimes these changes are so sluggish that it is difficult to differentiate the cancer from a low grade of chronic infection. Ordinarily the tissue reaction to injury continues only so long as the insult persists and then the cells return to their normal, but in cancer the tumor develops on this pathological tissue; perhaps as an infectious process.

General Characters of Tumor Growth

When a tumor is implanted its stroma and tissue cells both develop and the relative growth of each will determine somewhat the type of tumor growth. Very little is known of the lymphatics of a cancer although Evans has shown that abundant lymph channels are often present in the neoplasm.

The extension of cancer is through the growth of strands of tumor cells insinuated between the cells and fibers of tissues or vessel walls or by the discharge of cells like a spray through the lymph or blood vessels. The lymph channels are sometimes completely filled with these cancer cells, and may become choked and obliterated. Thus about the carcinoma there is an area where the lymph channels are full of cancer cells, although the lymph vessels by which the cells reached the area may be destroyed. Sometimes such areas may be found as nodules in the lymphatics far from the original growth.

Metastasis

As the tumor cells are transplanted along the lymph channel they are caught by the sinuses of the lymph gland and by a study of the lymph current we may learn where first to expect these emboli. Thus we find the tumor cells carried by the portal blood from the rectum to the liver. When the cancer cell is so transported and finds a suitable lodgment it produces a new growth of the same type as the original tumor. In this manner metastasis differs from the spread of infections where the reaction proceeds along established laws to combat the injury.

After operation to remove a cancer, new growths may develop in the original site either because particles of the neoplasm were left in the tissue because the excision was not extensive enough to include the original lymphatics which were infected; or because during the manipulations at the time of operation, loose cells were strewn in the exposed wound surface.

Contributary Causes of Tumor Growth

A number of factors bear important relationship in the development of cancer and are intimately associated with the growth of neoplasms and may be regarded as predisposing or contributary causes:—

1. Trauma (a) physical (b) chemical
2. Disturbances of internal secretions
3. Senility
4. Heredity
5. Individual susceptability.

Trauma

A single severe injury has but rarely been followed by the development of cancer, although sarcoma appears more frequently, and this development is more prone to occur where dense scar tissue has resulted. Cancer arises more frequently after long continued irritations of various kinds, during which changes there is destruction and replacement with some distortion and disarrangement of the cells. These chronic irritations occur in and about benign growths, ulcers fistulae and at those points in the intestinal tract which are normally narrow passages. The most frequent seats of cancer of the bowel are the rectum, sigmoid and cecum. These are the places where the fecal matter rests the longest.

Carcinoma of the lower bowel is quite common but the small bowel is rarely the primary seat. The large bowel contributes about 95 per cent of all cases of cancer of the intestinal canal, and of these the rectum contributes 80 per cent and the colon 15 per cent.

Charles H. Mayo (Chicago Medical Society, May 2, 1917) said of 100 cancers 2 occurred in the small intestine, 75 in the rectum and anus, 10 in the sigmoid, 10 in the right colon and the others distributed in the transverse and descending colon.

Bashford (*Publications* of Imperial Cancer Research Fund 1904-1912) concludes that heredity shows no predisposition.

Carcinoma appears usually in persons who have passed middle age and are rare in young people.

Undoubtedly many persons resist the development of cancers just as some people escape the acute exanthematous fevers. We have no way of determining this. Ehrlich (Apolant and Ehrlich, Genese des carcinomas *Verh. Dtsch. Path, Gesellsch,* 1908, XII. 3) has offered as an explanation of this immunity, the idea that a tumor requires for its growth a certain specific substance. He found that by inoculating with rapidly growing tumor he could inhibit the growth of another tumor, but these principles have not been applied to the treatment of human cancers. The question arises as to whether a predisposition may not be necessary to prepare the soil for cancer. Hauser was among the first to insist that tumor growths could be explained only by assuming first a profound change in the cells of which it is composed. Hausemann termed this change anaplasia by which the cell may not be altered in its form but is modified so that it proliferates rather than functionates. (Anaplasie, bosartigen Geschwulzte, Berlin, 1893-1897). This may be accompanied by changes in form and arrangement of the cells and associated with atypical mitoses.

The practical lesson from this is:

1. Cancer is a local disease always starting in some one spot.

(Concluded on page 230)

The Physician's Month in the Law Courts

ARTHUR M. HARRIS
Seattle, Wash.

When, if ever, is it actionable negligence for a physician to fail to make an *x*-ray examination in diagnosis or in treatment?

This is a question which has vexed the courts of the United States since the use of the *x*-ray has increased in practice of medicine; that means, of course, for a considerable time, now. The answers made by the courts to this question exhibit varying lights and shades so that a composite definite pronouncement is not to be easily arrived at. Some broad principles may be said to have emerged from this wide discussion, which are supported by a fair common agreement. Under the guidance of the learned supreme court of Wyoming, which has delivered recently a most exhaustive discussion of the matter, marshalling and attempting to distinguish or to reconcile all the previous leading cases on the subject, we shall glance at one or two of these more or less generally accepted principles.

The facts of the case upon which the Wyoming court reflected appear to have been substantially these: The patient (plaintiff) while participating in a motorcycle race met with an accident in which he sustained a fracture, simple and transverse, at a point about nine inches above the knee. He was taken to a hospital and the physician (defendant) was engaged to treat the injury.

In the lawsuit which later resulted between the patient and this physician, the patient charged negligence and alleged the following circumstances in proof: the physician, before using the method of treatment known as Buck's extension, made no *x*-ray examination of the fracture; that the patient was in that particular hospital for five weeks and during that time the physician made but one measurement of the leg, and that about eight days after the patient's admission to the hospital; that in his daily visits the physician merely looked at the leg "felt it and went away;" that within a comparatively short time a "lump" began to form on the limb, which the physician said he thought was a "callus on the bone"; that after three or four weeks the leg began to swell and this the physician is alleged to have said was a "pure and simple" case of phlebitis, caused by poor circulation, for which he ordered hot applications to the limb, by which applications the patient was seriously and painfully burned, and that the swelling continued rather than diminished; that being requested early in the history of the case to make an *x*-ray examination of the injury, the physician replied "I cannot get a machine and the patient cannot be removed to where there is one."

Further facts educed were that after the appearance of the swelling of the limb—three or four weeks after the injury occurred—an *x*-ray examination was made by another physician, with the knowledge and consent of the attending physician, but that the plates were blurred and indistinct, sufficient, however, for the *x*-ray operator to observe to the patient that he thought he had not yet "got a union." It also appeared that after some weeks in the first hospital the patient, at his own request, was removed to another hospital in a town some distance away and by train; that the attending physician advised against such removal but thought "it might do no harm," but was not present when the patient was carried to the train. The defendant's connection with the case ceased with the removal of the patient and the latter passed into the hands of other physicians. On the claim that the leg had been permanently injured by the first attending physician he was sued for damages.

The second attending physician testified that an open operation was deemed necessary to fasten the fragments of the bone together, "made necessary because of the failure of efforts to maintain apposition by other methods, including that of Buck's extension," the bone fragments being found to be overriding. He testified that he had no difficulty on his first examination of the injury to determine that the bones were overriding because the leg was several inches too short.

A hypothetical question was propounded to an expert witness for the patient, which, however, did not cover all the specific facts of the actual injury, but apparently only the general method of treatment for an injury of the kind suffered by the patient. The expert answered that fastening adhesive tape and fixing the lower part of the leg to obtain traction and sufficient resistance were placed so as to obtain paralysis of the muscles, that reduction could be accomplished, which would probably be within a few days, was very correct; putting the extension on was quite correct. But the *x*-ray examination was perhaps delayed, and that at the earliest possible time measurements should have been made with frequent radioscopes, to ascertain whether or not there was a proper reduction.

That an *x*-ray examination should be made almost immediately after the injury, within two or three days at any rate; that the supposed callus was probably a lump which could only indicate malapposition of the ends of the bones and that upon the appearance of such lump further reduction was indicated; the expert adding that "any doctor attempting to treat a fracture takes an *x*-ray."

At base, therefore, the case turned upon the failure to use the *x*-ray in the usual time. There was no incorrect diagnosis here, no negligence in that respect, for the defendant physician had correctly determined the nature of the injury, but the general idea was that the proper use of the *x*-ray would have materially aided in securing apposition and prevented permanent impairment of the limb. There was some charge of negligence concerning the application of the adhesive tape, but the court dismisses this point by observing that there was no testimony, expert or otherwise, explicitly showing that the application of the tape was improper in view of the location of the fracture.

Taking up the question of the use of the *x*-ray, the supreme court declares that there is no negligence in failing to make an *x*-ray examination if proper diagnosis may be made without one. This is one of the broad principles which may be said to have the concurrence of all courts. Having correctly ascertained the position and nature of the fracture, the defendant was not negligent in failing to use the *x*-ray at the beginning of the case. But the court follows this by a statement which strongly implies that even had the defendant not correctly diagnosed the injury in the first, his failure to use an *x*-ray would not be negligence. The court says: "negligence being charged in defendant's failing to bring to his aid this comparatively new apparatus (the *x*-ray) which we do not understand is yet recognized as a

necessary or usual part of the equipment of a general practitioner's office, at least in the ordinary community, we think it was the patient's duty to show that such a machine was available for the defendant's use or at least might have been easily procurable." The important qualification of "availability" must be noted here. As to the use of the *x*-ray in the course of treatment the court holds that such a machine not being available, it was not necessarily negligent to fail to use one to determine whether the bones were in apposition, and further that a successful result is not guaranteed by the physician.

Here then is the general point of view of the court—the measure of a physician's negligence is in the treatment of a given condition by ordinarily careful and prudent physicians generally, and that the use of a method or apparatus not uniformly established in the practice is not a proper element of the measure of negligence.

This would be pretty clear were it not for the use of that artful little word "available" in the quotation above made from the court's opinion. This leads us to attempt some such statement as this: If ordinarily prudent and careful physicians, to whom a given apparatus or method of treatment is available, use such method or apparatus, then failure in a given instance to do so, will probably be negligence.

But what is "available?"

Ah, there's the rub. A machine twenty-five miles away might be considered available by one court but, by another court, not available. In the present case the fact that *x*-ray examinations were made, though late in the history of the case, would indicate that a machine could not have been very far away, and still, the court, in dismissing the case against the doctor, regarded it as unavailable. It all means practically that we must use the most approved methods whenever possible, even if they are not easily "available." It's the safest way.

On other points of the case, the court considered that there might have been some harm in removing the patient, to which the defendant had been adverse. As to the burns, if any, they were done by the nurse and the doctor was not liable because he did not personally supervise the applications and the nurse was not his agent or employee. This last is a good point to bear in mind.

Precancerous Conditions

(Concluded from page 228)

2. A careful consideration of precancerous conditions prevents cancer from developing. Hence it is the duty of every physician to advise the removal of every precancerous condition before there are any signs of changes taking place in it. The safest way is to remove any precancerous condition while it is quiescent by relieving

1. Digestive disturbances (a) constipation (b) diarrhea.

2. Benign tumors—hemmorrhoids, warts, polyps.

3. Ulcerative conditions, fissure, ulcers and fistulae.

Cancer of the terminal bowel is most frequently found about three to five inches within the rectum, the lower limit being on a level with the internal sphincter, next in frequency at the anus—Williams estimates three cases at the anus to forty within the rectum—and least frequently the growth is situated in the upper rectum or sigmoid. The region extending up from the internal sphincter is not only the most frequent site, but also the most fatal for at this point disease more rapidly runs its course and is more liable to accidents on account of increased anatomical dangers of obstruction.

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Pneumonia

(Continued from page 222)

several cases of pneumonia. Hiss and Zinsser observed one such troop and found after a long march in the wet 27 cases of pneumonia.

B—Immunization Against Pneumonia

Hygienic measures are hard to enforce and under certain conditions impossible to maintain. Moreover, there are times when crowding, exposure and fatigue are unavoidable. This is usually the case in armies, camps, schools and institutions. In view of the remarkable success of typhoid vaccination, it would be a wonderful thing to have a similar active immunization possible for pneumonia. This could be employed in situations where the general measures are impracticable or fail.

The question of the immunity produced by an attack ot pneumonia was touch upon before. Clough, Blake and Dochez have all shown that a high degree of immunity is demonstrable against the homologous strain in patients convalescing from pneumonia. Yet it is a proven fact that one attack of pneumonia predisposes to another. Norris found in a series of over 12,000 cases that 16 per cent had been attacked for the second time. Cecil investigated these recurring attacks and found that the large majority of cases showed a different type of pneumococcus each time. Several cases, however, had repeated attacks of Type III infection. These attacks have only rarely occurred in the same year. The immunity following an attack was found to last from 6 months to one year. After that period it is shown that those who have had an attack are definitely predisposed to another. This appears to be paradoxical, but may have this simple explanation: that those factors which precipitated the first attack continued to act after it, and as soon as the immunity disappeared, brought on the second breakdown. These factors may be any of those discussed under the predisposing conditions.

Therefore it is the duty of the physician to investigate the possible cause of the patient's susceptibility which permitted him to come down with pneumonia. If this cause is not corrected it would be natural for a second attack to occur once the immunity due to the first disappeared.

I—Active Immunization in Animals

A. Frankel, in 1885, showed that rabbits inoculated with live virulent pneumococci developed a high immunity against pneumonia. His was the first work with active immunization against pneumococci. Following him, Klemperer found that using heated pneumonic sputum of heated cultures of pneumococci he was able to get similar results. Emmerich followed up this work and found that he was able to produce an immunity sufficient to enable the animals to withstand the injection of 20—30 c.c. of a highly virulent strain. Neufeld, Levy and Lister were able to produce similar immunity by the subcutaneous injection of killed pneumococci.

In 1918, Solis Cohen and Heist found whole blood of immunized rabbits especially bactericidal. The interesting feature of their work was the fact that they never found any immune bodies in the blood before the seventh day after the injection of the vaccine. This suggests that in man the same condition may hold true, accounting for the occurrence of the crisis about the seventh day of the disease. Larsen and Nelson found that if the pneumococci were first treated with sod. ricinoleate, then these immune bodies made their appearance much earlier in the blood of the vaccinated animal. These

experiments proved one thing—that it was possible to produce in animals immunity against the pneumococcus. It did not follow that these animals were immune to pneumonia. Wadsworth realized this and tried to produce an active immunity against experimentally produced pneumonia. He was never able to produce a typical pneumonic process in his rabbits. He was able to produce a patchy consolidation by intra-tracheal injections of virulent cocci. Most of the animals he had immunized were able to resist this infection.

Cecil and Blake in 1920 were the first to produce true experimental pneumonia in monkeys. They used minute injections of virulent cocci intra-tracheally. Against this pneumonia they were able to produce partial immunity by the use of lipo-vaccine which was injected subcutaneously. They found that a living, virulent culture subcutaneously also produced immunity, but proved fatal too often. It is interesting to review each piece of work, as it was done usually to push on something somebody else had started. Thus Cecil and Steffen set out to produce complete immunity against the artificial pneumonia they were able to produce. They went on the supposition that the doses of vaccine previously used were too small. They therefore increased the amount of vaccine considerably. They found that three large doses of pneumococcus Type I vaccine conferred complete immunity to experimental pneumonia with that type. In subsequent work the same results were obtained with Types II and IV. Of significance is the fact that a Type III vaccine conferred immunity in only 4 of 8 monkeys injected.

An interestinf fact which supports the belief previously expressed—that the local resistance of the lung played a part in the immunity against the disease—was brought out by the next piece of work Cecil and Steffen did. They attempted to produce immunity in monkeys by intra-tracheal injections of vaccine. They gave three injections at intervals of a week. They produced a resistance to infection and yet the peripheral blood showed no anti-bodies. Thus the possibility of a local immunity of a new type is suggested. It may well be that there were signs in the general circulation of this immunity in an unknown form. This includes practically everything done with animals in the investigation of the problem of the production of an active immunity against pneumonia. The results were very encouraging and promised as much success as was obtained with typhoid. This therefore led to experimental vaccination in humans. This work is still in its infancy and very limited. On the pages that follow an attempt will be made to summarize the experiments performed.

II—Active Immunization in Man

The first work done was by Wright, in 1911, in the gold mines of the Transvaal. He not only inoculated miners with the vaccine, but developed a new way of estimating the degree of immunity conferred by means of his opsonic index. This he had to abandon as far as pneumonia was concerned, for there was no definite parallelism between the index and the degree of immunity to that disease. Therefore Wright used the difference in incidence of the disease among the 2,000 miners inoculated and as many controls to determine the value of the procedure. He concluded that the incidence of the disease was reduced the first three months after inoculation. But his work is mostly of historical importance, for he did not know of the typing of the pneumococci.

Lister, in the South African Institute for medical research, worked out his own classification of types of pneumococci and then proceeded to experiment with the possibilities of vaccination. Working with miners he found that immunity was producable. To try out the idea best he employed troops. He vaccinated about 11,000 recruits. The vaccine was a triple one containing six billion each of his A, B and C types. It was given in three doses. Not a single case of Type A, B or C pneumonia developed in the vaccinated troops. There were 82 cases of the other types. Among the unvaccinated troops the mortality for the same period was 34 per cent. There were no unpleasant results from this vaccination. Lister claims that the controls were indirectly benefited by the inoculation of the other troops because the inoculated ones were no longer carriers. Therefore the results of the inoculation were even better than was apparent. In his last report, two years ago, Lister gives the results of six years of vaccination carried on at the Premier Mine. In the six years the death rate from pneumonia dropped from 5 to 1.6 per 1,000.

In 1917—1918 the influenza epidemic brought with it a greater prevalence of all respiratory diseases, pneumonia included. At Camp Upton this increased frequency of pneumonia led Cecil and Austin to try Lister's work on their troops. Vaccines were prepared from glucose brothcultures. A total of 6—9 billion cocci of each of the first three types was given in ¾ doses, at weekly intervals. They vaccinated about 40 per cent of the men (12,519). The reaction to this vaccine was less severe than the reaction to typhoid vaccine. The vaccination began Feb. 4, 1918, the division was transferred April 15, 1918. Thus the results of the vaccination could be followed for only ten weeks. In the vaccinated group there were really no cases of the first three types of pneumonias, one man developed a Type I 24 hours after the vaccination. Here there was no chance for immunity to develop. There were 9 Type IV pneumonias in this group. The case mortality was 11.7 per cent. In the control of about 20,000 men there were 26 cases of the first three types and 33 cases of the Type IV pneumococci. The case mortality was 28 per cent.

These results were so good that Cecil did another field experiment, at Camp Wheeler. Vaughn worked with Cecil here. About 80 per cent of the camp was vaccinated (14,000). In spite of an epidemic of flu in the camp the results were as good as before. The organisms in this vaccine were suspended in oil. Ten billion of each of the first three types were used. There were as many cases of pneumonia in the 20 per cent that were not vaccinated as in the 80 per cent that were. These results were obtained in spite of the fact that the lipo vaccine was found inferior to the ordinary suspension in saline.

In a report of the Surgean General's Office in Washington on the vaccination of 4,754 men it was stated that only one case developed among these and 80 in the rest of the camp.

Major Meader tried out vaccination extensively. As the table below shows, the incidence of pneumonia was cut in two by the use of vaccine.

Results of Vaccination Against Pneumonia.

Number of Men		Number of Cases		Number of Deaths	
Vaccinated	Not v.	V.	N. V.	V.	N. V.
45,849	49,463	38	83	5	11

Major Boul, of the French Medical Corps, reported on the use of vaccine in the case of colored troops which showed a high incidence pneumonia. Three battalions were vaccinated and three were used as controls. Al-

though this work was done with no attention to the type of pneumococcus vaccine used, the results were good.

III—Conclusions

Almost without exception vaccination has always shown some benefit. Also without exception it has never resulted in any serious complications. Therefore it appears advisable to institute vaccination in armies, institutions and in communities where the incidence of pneumonia is high in spite of all other measures.

It is on these other measures that we must rely chiefly in order to control pneumonia. Public education as to the factors that predispose and compulsory supervision of cases are very esesntial. The most important step in the prevention of the disease is an effort to improve the conditions of life of the poorer classes. The world has awakened to the fact that in pneumonia there is a problem that must be met at once. This fact is in itself encouraging and a solution to the situation may be expected.

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Cumulative Effects of Scilla

A strong cumulative action of scilla is denied by E. Koerner. Prolonged treatment, especially in tablet form, may therefore be safely conducted. Especially good results were obtained in arythmia, in which case scilla proved superior to digitalis and to quinidine. Sudden deaths may be attributed to over-dosing following intravenous injection. As with digitalis these disturbances are due to overstimulation.—(*Ther. d. Gegenw.*, No. 10.)

Shall Pharmacists Serve Physicians?

The committees on biological products of the American Pharmaceutical Association and the National Association of Retail Druggists have made an exhaustive study of the distribution of biological products and other medicaments.

They have found that a more efficient and reliable service can be rendered to the medical profession by the professional pharmacists of the United States in supplying such products if physicians will give their support to our activities.

The committees, headed by Samuel S. Dworkin, are inaugurating an educational campaign among pharmacists to maintain an ample stock of biologicals and allied products under proper refrigeration to meet the requirements of the medical fraternity. Service to physicians is the keynote of the campaign.

Biological products are becoming a greater factor in the modern materia medica every day.

Millions of patients are being treated with these products daily and judging from the astounding results achieved by this form of medication it is only in its infancy. Millions of dollars are being invested in research work in biological, chemical and pharmaceutical laboratories that represent an enormous capital investment.

Modern medicine in its scientific pursuits not only strives by these means to cure the scourge of many diseases that afflict mankind but even greater attention is being given to the subject of preventive medicine as is shown by the extensive use of such biologicals as diphtheria toxin anti-toxin mixture for immunization against diphtheria or authorized scarlet fever streptococcus toxin for active immunization against scarlet fever.

However, with all these advances in the science of medicine little attention seems to have been given to the adequate and proper distribution of these important products.

It stands to reason that manufacturers of biologicals, chemicals and pharmaceuticals cannot maintain in addition to their research and manufacturing laboratories, distributing depots in all parts of the country where physicians can be promptly and efficiently served with their requirements day and night.

The question therefore arises, who shall be the logical distributor for biological products and other medicaments and what should be required of him?

A recent survey made throughout the United States reveals the fact that vast quantities of these products are being distributed in a more or less haphazard manner by supply houses who engage in this business largely in a commercial way only without any attempt to render a real professional service to the medical fraternity.

The proper storage under refrigeration, the prompt delivery of all orders, the selection and carrying stock of only products of the highest standards, the checking up of stocks of outdated potency, are only a few of the important duties that devolve upon the shoulders of the distributor.

Summing up all the factors that enter into the distribution of biological products, ampules for medication and other medicaments, who is better qualified and who should be looked to as the logical distributor of these products other than the professional pharmacist? The physician of today is one of the principal guardians of the public health and the professional pharmacist is the other.

Pharmacists are prepared and ready to serve physicians as professional men and it is our belief that the medical fraternity will be served better, more efficiently and with a greater professional understanding if they will encourage pharmacists by looking to them as the logical distributors for biologicals, arsphenamines, insulin and medicaments of all kinds.

The question of what the pharmacist should charge for his services as a distributor is one which also deserves discussion. As a rule the professional pharmacist will only ask a fair percentage of profit to cover his overhead charges, such as rent, heat, light, clerk hire, maintenance of refrigeration, etc., on his sales to physicians for products to be used in their offices or for personal use.

However, too often when patients ask what the cost will be to them of certain medicaments prescribed for them, physicians unintentionally make the error of quoting the price at which they themselves buy these same products for their own use. This is not the general practice but in justice to the professional pharmacist and the service he renders, this erroneous practice should be brought to the attention of the medical fraternity.

Every physician will grant that the professional pharmacist is entitled to a legitimate margin of profit in excess of his overhead charges on sales he makes to the consuming public whether such represent physicians' prescriptions or other products.

As a matter of professional pride, from the standpoint of service and sound economics the committee offers this suggestion and also in the hope that it may bear constructive suggestions and criticisms from its friends in the medical fraternity. A broad discussion of this problem in all its phases will be welcomed either by direct correspondence or through the columns of the MEDICAL TIMES.

Diagnosis and Treatment

A Case Illustrating the Value of the Sphygmomanometer in Cardiac Diagnosis

This case is recorded by T. Stacey Wilson, as it shows the very important assistance in diagnosis and treatment which may be given by a careful use of the sphygmomanometer.

The patient was a woman, aged about 50, suffering from broncho-pneumonia. Her face was dusky from cyanosis, her head only slightly raised on pillows, and no true orthopnœa and she was not extremely breathless. By means of the sphygmomanometer the following facts were ascertained: The systolic pressure as judged by the finger was 138. The range of oscillation of the brachial pulse was good; there was 3 mm. of movement of the Tycos needle at 140, 4 mm. of movement observable between the pressures of 100 and 130 mm. Hg, and at 110 there was an oscillation of 5 mm.

Had there been the myocardial failure of the left ventricle which her condition seemed to suggest, there would have been a low systolic pressure and an oscillation of 2 mm. or less. The above observation, therefore, showed that the muscular vigour of the left ventricle was good, and also that there was good tonic contraction of the peripheral vessels, in spite of the fact that clinically the patient appeared to be threatened with death from heart failure.

On using the stethoscope the following facts were elicited: The systolic sound was not lost till a pressure of 148 mm. Hg was reached—namely, 10 mm. higher than the systolic pressure as judged by the finger, and the loud sound ceased at 140. This practically coincided with the results obtained by the finger. The lowest limit of audibility of the sound was very low——namely, 50 mm. Hg—and a loud sound became audible at 58. The important point about the character of the sound was that between 66 and 138 mm. Hg it was very loud and almost "rapping" or "slapping" in character and between the pressures of 86 and 110 it was extremely loud and rapping and resembled the sound which is characteristic of Grave's disease.

This type of sound and the low diastolic pressure both suggested that the arteries were badly filled, and therefore if one could have taken a tracing of the artery between these pressures of 100 and 130 we should have found that although the range of oscillation appeared to be good the pulsation of the artery would have been a very collapsing one, resembling the aortic pulse in type.

This study of the blood pressure clearly demonstrated that the author was dealing with a left ventricle of good muscular vigor which was being badly filled with blood—a condition very liable to result in fatal syncope, and whose cause must be either a muscularly weak right ventricle or interference with the passage of blood through the lungs. The venous beat in the neck could be felt to be of good strength, the sounds at the tricuspid and pulmonary areas were of good tone though not distinctly accentuated. The liver was enlarged and pulsating slightly. All these facts pointed to a right ventricle of good muscular tone and therefore the cause of the patient's danger must lie in the pulmonary circulation. A relative emptiness of the left ventricle was suggested by the extreme feebleness of its sounds (in spite of the character of the arterial pulsation), by the absence of any palpable impulse, and also the absence of any cardiac dullness except quite close to the sternum.

On inquiry as to symptoms suggestive of asthmatic attacks it was ascertained that they were present, and the general presence of wheeze as well as of moist sounds (suggestive of broncho-pneumonia) confirmed this diagnosis. The case, therefore, clearly called for treatment as a case of asthma and not for cardiac stimulation, which would in all probability only have aggravated the symptoms. Such cases, as a rule, improve rapidly by treatment with stramonium both in the form of smoke from asthma powder and by ℥ 15 or more of the tincture internally every four hours. Sometimes the improvement is quite dramatic in its suddenness.

In the case in question the condition of the lungs was due to pneumonic infiltration complicated by chronic nephritis as well as to bronchial spasm and the effect of the treatment was therefore much less rapid and effective. Nevertheless, two days later (although the general condition of the patient was showing little if any improvement) the condition of the circulation had changed.

The range of oscillation was now about normal—namely, 2 mm. at 80 and 90 mm. Hg, and 3 at 100, 2½ at 110, and ½ at 120. The systolic pressure as measured by the finger was 120 and by auscultation 126, instead of 138 and 146 respectively two days previously. The diastolic pressure was 60, and the commencement of a loud sound 66 as against 50 and 58 previously, and the rapping sound was much less loud and only heard between the pressures of 76 and 118 mm. Hg. Whereas two days previously the audibility of this sound commenced at 66 and was continued up to 138 mm. Hg. In spite of these figures, which point to weakness of the heart's action, and also in spite of a pulse smaller and weaker than two days previously, the action of the left ventricle was on this date apparently more vigorous. There was a distinct and well-defined apex pulsation about the nipple line and the cardiac sounds audible over the left ventricle were much louder and showed more tone than two days previously. The venous impulses in the neck and the sounds audible over the right ventricle were much the same.

It was, therefore justifiable to conclude that the treatment had sufficed to lessen the interference with the pulmonary circulation and that the left ventricle was being much better filled than two days ago, but that the patient was now being threatened with death from exhaustion owing to the severity of the broncho-pneumonia, and the nephritis from which she was suffering.—(*Lancet*, May 1, 1926.)

Venesection for the Decompensated Heart

As is well pointed out by Gordon in a recent issue of the *American Journal of the Medical Sciences*, there can be little doubt that venesection is not practiced at this time with the frequency which it deserves. It is scarcely credible that our forebears, who undoubtedly practiced venesection to excess, can have been utterly mistaken as to its value, the probabilities being that brilliant results in a few cases led them to expect similar effects in many others.

There can be no question that in ruptured cardiac compensation manifesting itself by great venous turgescence so that the jugular veins are prominent and the veins in the arms are so engorged that the valves appear like knots, venesection if freely practiced often gives the patient very extraordinary relief. There is probably little use in taking less than eight to twelve ounces, depending, of course, upon the size and plethoric condition of the patient. Where there is a diffuse cyanosis, more capillary in its nature and unaccompanied by marked venous engorgement, we have never seen venesection do good and believe that it often does harm. So, too, it is not to be forgotten that when a patient is bled by the opening of a vein he loses an enormous number of red and white cells which he will not be able to replace immediately, and these red and white cells may be said to be as valuable to a patient who is ill as silver and gold dollars are in helping him in his struggle with life. In some instances it may be easier for him to replenish his pocketbook than to replenish his store of corpuscles. The more severely ill he is the less rapidly will reproduction of these cells take place.

From Gordon's investigations, in which he called to his aid the *x*-rays to determine the effects of venesection upon the heart, he is led to believe that cardiac dilatation and distention are materially decreased by this therapeutic measure, and we can readily understand why this should be true, with particular reference to the right side of the heart with its associated engorgement of the vena cava, upper and lower, and with the associated increase in the size of the liver from congestion. When in association with ruptured compensation there is also present a nephrosis, then the wisdom of employing venesection has to be even more carefully considered than in the instances which we have named, since nephrosis is often productive or associated with considerable anemia, the condition of the kidneys evidently resulting in a destruction of red cells and a marked diminution in the bacteriolytic power of the blood serum.—(*Ther. Gaz.*)

Diseases of Middle Life

Sir William Hale-White says middle life is the period between thirty and sixty years of age. He states that probably no infection is more commonly overlooked than ill health due to the presence of the bacillus coli in the urine. In other words, while recognizing that this condition is by no means rare in infancy, he believes it is most common in middle life, pregnant women being the sufferers as a rule, and he gives statistics as being 8.5 for women to 1 for man. Contrary to common opinion he does not believe that this state is seen more frequently in association with constipation and intestinal disorders than in other patients, and he points out that in 80 per cent of the cases there is pyelitis of the right kidney alone, and the relative immunity of the left kidney so far as he knows has not yet been explained.

Oftentimes the presence of this condition results in the diagnosis of lumbago, of renal calculus, and sometimes of appendicitis. Frequent urination with pain and incontinence of urine are often present, and the urine may have what he calls a characteristic "fishy" odor, a little albumin, sometimes pus, and rarely blood.

It is to be recalled, however, that before deciding that the bacillus coli is the cause of symptoms a specimen of urine should be obtained by the catheter, as otherwise external contamination may nullify the value of the test.

Occasionally such a patient may be very ill and suffer from chills, but he insists that in the pregnant woman at least this state never calls for interference with pregnancy nor for operation on the kidney, and that it is rarely, if ever, fatal.

Rheumatic fever is rare in middle life, unless there is a history of previous attacks. In other words, that a person between thirty and sixty suffering from an acute multiple arthritis is most commonly a victim of septic or gonorrheal infection.

Syphilitic infection usually takes place before the age of thirty, whereas the late manifestations develop between that age and fifty; that it may be difficult to distinguish between carcinoma and gumma of the liver, but that neither jaundice nor ascites are met with as symptoms of gumma; and, again, that if a middle-aged man has hemiplegia, it is probably due to syphilis of the cerebral arteries, because he has not reached an age at which cerebral hemorrhage usually occurs from advancing years.

Thoracic or abdominal pains have often led to surgical interference, with the result that nothing pathological was found in these regions. Tuberculous meningitis, so common in children, is excessively rare in adults. While thousands of people with pulmonary tuberculosis recover completely, he insists upon the importance of hemoptysis as being a grave symptom, believing that for practical purposes it always means tuberculosis, but on the other hand he states that if there are no physical signs elsewhere in the lungs, a cavity of the lung at the base should never be diagnosed, for such a diagnosis is sure to be wrong. While acute bronchitis is a serious malady in the old and the young, it is not so serious in the middle-aged, and that asthma, which is not uncommon at the age of thirty, diminishes in frequency in later years of life.

If disease of the aortic valves alone is present, or if it precedes that of the mitral leaflets, the cause is almost certainly syphilis. And, again, that drug addiction is more apt to occur in middle life than at other periods. We do not think that this is in accord with general experience, since addicts in the United States are most commonly met with, we believe, below thirty and in diminishing numbers as old age is approached.

He concludes by urging the importance of vaginal and rectal examinations when symptoms of trouble are present in these regions, because all too frequently in this period of life the presence of carcinoma is not recognized until the disease is well advanced.

In the same journal, Sir Thomas Horder deals with certain aspects of this subject under "Diseases of Adult Life," taking up the consideration to a large extent of pathological blood-pressures. He emphasizes the necessity in the presence of arterial change of avoiding stress and strain, since the patient under these circumstances cannot have what he calls the "enviable joy of stretching nerve and vessel and feeling them bend back again to their natural state as soon as the strain is relaxed." He advises mild exercise in the open air, which means the lost art of walking; an hour's rest in the middle of the day, early going to bed, and investigation into any metabolic defects which may be present.

In regard to diet, he believes it should be most moderate, and reminds us that Dr. Leonard Williams would have us all fast for three days now and again, and if this be true for all, it would certainly be true for the high-pressure patient. He suggests that the substitution of red meat by a meal consisting of a few biscuits and a piece of chocolate would often be a valuable measure, although the high purin content which we know is present in chocolate would in our opinion seem to indicate that some substitute would be better. In many instances we can do so little for high blood-pressure from the standpoint of dietetics except by advising moderation, that the patient is made wretched both mentally and physically by rigidly excluding customary articles from his diet.—(*Practitioner.*)

Cancer—Its Cause and Prevention

Cancer, always a topic which holds the attention of the public, has been more than usually discussed in the press, both lay and medical, during the past few months, largely on account of the interest excited by announcements made by Barnard and Gye, and the editorial attention given to them by leading medical journals. Needless to say, many who are speaking on the subject have no authority to do so either through training or attainments. Those best qualified to speak are proceeding cautiously and investigating before expressing opinions.

Alleged discoveries of the specific cause of cancer are not new. Since 1921, Dr. James Young of Edinburgh has been writing on what he considers the causative organism of cancer. Glover of Toronto since about the same time has been making similar claims. For several years Dr. M. J. Scott of Butte, Montana, has been writing on the subject defending the position taken by Glover, though other investigators, perhaps better qualified, have failed to be convinced. In November, 1925, Loudon and McCormack published an article in Canada in which they claim to have confirmed the finding of the "pleomorphic microörganisms isolated by Glover and Young." Nuzum of Chicago, Stearn, Sturdivant and Stearn of Pasadena, and others have reported findings which certain persons are now trying to identify with the supposed microörganism of Barnard and Gye. In the case of some of these writers the claims go quite far. Scott claims to have produced malignant epithelial tumors in monkeys and to have cured a number of cases of cancer in human beings by means of a serum produced in horses by immunization against the Glover-Young microbe.

It is scarcely necessary to say that false hopes have been aroused, and those best qualified to judge have not accepted the claims made by any of these writers, with the possible exception of Barnard and Gye. In regard to their work, it has been repeatedly stated that even accepting it at its full value it is far from having solved the problem of cancer and, still more, far from having shown us how to prevent the disease or how to treat it. Indeed it is safe to say that the majority of pathologists are a long way from being convinced that cancer is a parasitic disease, and there are many good reasons for doubting its parasitic origin.

Those specialists who have spent years in the study of cancer and in experimental work upon it are the very ones who are most careful in their statements. Regarding the work of Barnard and Gye, which we may concede to be the most authoritative and scientifically sound which has been announced, scientific men feel that at best it will certainly be some time before it can be translated into methods of value in the prevention and treatment of cancer. Admitting that the observations are new, valuable, interesting, and suggestive, few scientific men are convinced that the work so far done will apply to human cancer, nor can positive statements be made concerning the manner in which the supposed germ acts upon the tissues in producing the disease. "It goes without saying that Gye's conception, in so far as it is based on experimental work, has to stand the test of experimental confirmation. . . . It is the first adequate explanation of the causation and growth of cancer and it points the way to further progress."

It is safe to say that dogmatic statements concerning cancer at the present time come only from the uninformed, the credulous, or those who have some ulterior motive in making them.

It is pleasant to be able to speak a little more optimistically concerning one of the newer methods of treatment—the Blair Bell lead method. Francis Carter Wood, director of the Institute of Cancer Research of Columbia University, has recently returned from Europe where he spent some time in carefully investigating all the available facts. The lead treatment promises to be an important contribution. The preparation used is extremely dangerous, can be made only by experts, keeps for only three days, and should be used only by those trained in its administration. The premature distribution of such a dangerous preparation among those not skilled in its administration would result in more harm than good.

We may summarize the situation by saying that while notable advances have been made in the treatment of cancer, and we hope also in the elucidation of its exciting cause, there are no facts at present which justify us in relaxing in any way the studies which are being made, the precautions which have been advised in regard to prevention, and the early treatment of lesions which experience has shown often end in cancer. The practical methods of value which have been proved by time and experience should not be abandoned for those supported only by theory.—(*Am. Jour. Pub. Health,* April, 1926.)

The Use of Sodium Thiosulphate in Diagnostic Procedure

Sodium thiosulphate in its active form is useful in the diagnosis of scleroderma in which arsenic is a contributing factor, says Myers, Marples, Groehl and Thorne. It is employed in such cases as those in which a pigmentation is observed. Continued use of fresh crystals of sodium thiosulphate releases the arsenic that has been deposited either in the skin, or along the nerve trunks until a gradual return of normal conditions is observed. The parchment-like conditions of the skin disappear under treatment and the pigmented areas disappear. A branny desquamation very frequently accompanies clinical improvement. Thus far no evidences of kidney dysfunction have been observed. In fact, quite the reverse is noticed, namely a stimulation of diuresis. The ingestion of large volumes of fluid is recommended. The patients respond promptly to treatment and the clinical symptoms improve.—(*J. Lab. & Clin. Med.,* June, 1926.)

Treatment of Multiple Sclerosis

Siemerling considers multiple sclerosis a spirochaetal affection and for its treatment gives preference to silversalvarsan combined with calcium chlorate. It has been demonstrated statistically that this method of treatment proves more successful than any other, even though the total result leaves much to be desired.—(*Ther. der Gegen.* No. 3, 1926.)

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H. SHERIDAN BAKETEL, A.M., M.D., F.A.C.P.
ARTHUR C. JACOBSON, M.D.
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The Medical Library

The Average Doctor knows just how to get the most out of all the sources upon which he depends for his knowledge, tools and skill, with the exception of the medical library.

The paradoxical thing about this situation is that on the long list of such sources the medical library should stand first in order of importance.

The chief reason for this odd state of affairs has been the lack, heretofore, of bibliographic geniuses capable of selling to the doctor what is unquestionably the most precious of all his sources.

Among such geniuses now appears, in Brooklyn, Mr. Charles Frankenberger, Librarian of the Medical Society of the County of Kings, 1313 Bedford Avenue, and with his magic wand releases the Average Doctor from his bewitchment and the strange obsession that a cruise in an honest-to-goodness medical library, under a good skipper, is not fascinating sport. Brooklyn doctors who fall under the influence of the high-tension bibliographic emanations given off by Mr. Frankenberger invariably become fans. He has been doing this sort of thing for many years, with remarkable results for the library, which is now the fourth largest privately owned library in the United States, excluding the Surgeon-General's Library in Washington.

Among Mr. Frankenberger's publications and addresses on the subject will be found an especially good one in the February, 1926, issue of the *Long Island Medical Journal*, which tells practitioners how to avail themselves of the literature in a first class medical library, and why they should do so.

Chimpanzee Donors

Among the conditions which led Voronoff to choose chimpanzees as suitable donors of testicular grafts for the purpose of rejuvenation was the fact that the blood of these animals is practically indistinguishable in all respects from that of man; in fact, in all anatomical and physiological respects these apes are amazingly like us.

Dr. H. Gideon Wells, Professor of Pathology in the University of Chicago, in the course of a lecture in July at the Summer Session of Columbia University, remarked that the bloods of anthropoids are more closely related to human bloods, according to immunological tests, than the bloods of horses and donkeys are related to each other, although these two animals are so closely related to one another that they can hybridize. These blood reactions indicate, said Professor Wells, a closer relationship between the higher apes and man than exists between the higher apes and monkeys.

These things being so, why should not a few chimpanzees supply some of the blood needs of our hospitals?

Protein Metabolism in the Arctic

In the *Journal of the American Medical Association* of July 3, 1926, there is an interesting article by Dr. Clarence W. Lieb, of New York, on the effects of an exclusive, long-continued meat diet. The article is based on the history, experiences and clinical survey of Vilhjalmur Stefansson, Arctic explorer. Mr. Stefansson has lived for very long periods upon meat and water only and has enjoyed excellent health throughout such periods; at the present time he presents an exceptionally good physique. Dr. Lieb thinks that such an experience indicates the need of a recasting of clinical dietetics.

The article, however, does not sufficiently emphasize the fact that in the Arctic flesh foods, such as seal and caribou meat and fish, are usually eaten raw, and says nothing about the eating of the viscera. In other words, food of such character, so eaten, supplies even vitamin requirements.

Upon the basis of the Stefansson experience it would never do to revise radically our dietetic principles and practices, since in civilized communities cold storage and cooking deprive the flesh foods of some of their most important elements, and, in any case, but few persons could find it easy to eat raw viscera.

It is our conviction that protein metabolism under civilized conditions is a very different thing from that observed among those who, in the Arctic, adopt the eating habits of the Eskimos.

Beware Modern Youth

Much bunk is being written and spoken to-day about the wholesomeness of our youth, and said youth itself regards it as "applesauce." One of the cardinal principles of the new spirit of youth is that nothing matters very much. "Relentlessly it condemns the old times and the old men. It emerges disdainfully from institutions and allegiances. It refuses to war for causes not its own." The physician who, trained in the old school of human service and ethical obligation, falls too completely under the spell of our now rampant youth, will find himself insidiously deterred from acts of self-sacrifice or even of ordinary duty. For in the eyes of our juvenile cynics the Samaritan is a fraud exhibiting nothing but egotism, and he who is aided is never the precious soul and personality of the old dispensation.

Witter Bynner expresses perfectly the attitude of youth toward age to-day:

Said the old men to the young men,
"Who will take arms to be free?"
Said the young men to the old men,
"We."

Said the old men to the young men,
"It is finished. You may go."
Said the young men to the old men,
"No."

Said the old men to the young men,
"What is there left to do?"
Said the young men to the old men,
"You."

Our Social Pathology

Looting is always an accompaniment of social disaster. Hence the crime wave. Moral overstrain and a plethora of wealth, which conditions in the body social may be compared with polycythemia in the physical organism, constitute present-day disaster of just as real a type as that produced by fire, flood and pestilence. Hence the advent of the looting crook.

The obvious inability of society to cope adequately with the ghouls that beset it is in large part due to the asthenia that always characterizes a polycythemic state, be it physical or social.

Miscellany

CONDUCTED BY ARTHUR C. JACOBSON, M. D.

Dear "Health Talk Man":—

After listening to last night's talk about sending for the doctor, will you permit me to talk back? On general principle, the advice is sound, but I wonder whether the H. T. M. at all realizes how extremely difficult it is to follow, especially, in remote country districts, and at this season of the year. Many small towns have no physician, and "getting through with a car" is generally made the condition of responding to a call. I do not know of a country doctor so convinced of his own indispensability that he keeps a horse during the winter season. An elderly man in my parish a few years ago suffered agonizing pain with an attack of pleurisy for 36 hours, before a doctor could be secured. Except for the much deprecated home treatment, he told me afterward—probably with pardonable exaggeration—that he thought he would have died. Fifty years ago, a doctor would have *got through*, night or day, snow or no snow.

Much old-time self-treatment or home treatment was futile and foolish, probably, in some cases, vicious. Still, my experience has been that most people of the old regime were deadly afraid of "strong medicine," and I fail to recall an instance where domestic medication resulted in disaster, making due allowance for the inevitable. In a recent case I recall, a physician was called to treat an apparently ordinary case of gastric and intestinal disorder, with pain. A hypodermic was given, the patient relieved, everybody went to bed, and patient was found dead towards morning. If the patient had been relieved by domestic treatment, many would have said, "If they had only sent for a doctor." The unexpected often happens. President Harding died unexpectedly under the closest medical surveillance.

May I venture the conviction of my own that, with the growing scarcity of medical aid in many country districts, it is a sad pity that intelligent people do not give more attention to the home treatment of trivial ailments. To be sure, the ailment may prove not to be "trivial," but, on this score, even the competent physician is open to error in diagnosis. I can't avoid the feeling that a good deal of popular "health talk" is calculated to inspire a groundless apprehension, which reacts unfavorably upon people of a nervous temperament. Modern medical nomenclature is solemnly held up to public view as a possible "nigger in the woodpile." "Mastoiditis"—why not broadcast the reassuring fact that it is a rare complication? Half the value of the old-fashioned doctor was his reassuring talk, his genial laugh. His hour-long call left confidence behind him. He came out of his sanctum of superior knowledge and experience to tell us we weren't tottering on the verge of the grave. If we were, we went over, without being scared to death prematurely. To an old lady ill with a chronic complication of diseases, the physician said, "If you're here Tuesday, I'll call again, but I don't think you will be." She turned over, closed her eyes, and obediently began dying. A more genial physician was called—by the way, something of a quack, I fancy—and she lived several years. To many people, a simple sneeze is a "Lo, from the tomb a doleful sound!"

Why not help out the thousands of people in country places who find difficulty in getting medical attendance? Why not talk about the family "medicine chest," and the right things to keep in it, and how to use them intelligently? "Treat symptoms"—occasionally M.D.'s do that. People *do* it, anyhow, often *have* to do it. Why not help them to do it intelligently?

Editorial Note:—The Family Medicine Chest was the title of a health talk broadcast by the Department from station WGY on Friday, October 3, 1924.

—*Health News* (N. Y. State Dept. of Health).

The Physician's Library

Clinical Pediatrics. By John Lovett Morse, M.D., Professor of Pediatrics, Emeritus, Harvard Medical School. Philadelphia and London: W. B. Saunders Company, 1926.

The name of the author of this newest treatise on children's diseases is one to conjure with in New England. It is natural, therefore, that a book by him will merit the respectful attention of the medical world.

A lucid teacher, a thorough diagnostician and a scholarly practitioner, Dr. Morse has shown all these characteristics in the pages of this volume. It is Morse's book, not a hodge podge from Tom, Dick and Harry, skillfully compiled by a literary agent for a man with a reputation.

Those who know this author will reach for the book, for his observations are worthy of study. Those who know him only by reputation should reach for it with both hands, for it gives the personal findings of one of the most competent pediatrists in America.

To be sure, this is a text book on children's diseases, but it is so presented, with so much of the personal Morsensian flavor that men interested in the subject will read it with as much gusto as lovers of adventure and the Sahara read Beau Geste and its companion book, Beau Sabreur.

Experimental Pharmacology. By Drs. Hans H. Meyer of the University of Vienna and R. Gottlieb of the University of Heidelberg. Translated by Prof. Velyien E. Henderson of the University of Toronto. 656 pages. Philadelphia, London and Montreal: J. B. Lippincott Co., 1926.

Difference in arrangement and philosophical insight characterizes this important contribution to pharmacologic literature. Instead of grouping drugs in botanical classification according to their actions in the human body, the authors regard the physiology of each organ and its pathological conditions. They set forth how certain drugs can alter the functional activity of the particular organ. Thus they pave the way to a complete understanding of therapeutics.

Various chapters discuss the pharmacology of motor nerve endings, the central nervous system, sensory nerve endings, the eye, digestion, the genital organs, the circulation, respiration, the kidney, sweat secretion, metabolism, muscles, blood, temperature regulation, and inflammatory processes, as well as pharmacological actions on the causes of death, and the mode of action of drugs and the conditions determining their action.

The translation is sufficiently free to be easy reading, the bibli-

ography is exhaustive, the foot-notes are enlightening and the subject is covered in a most comprehensive manner.

Congratulations are due Prof. Henderson for the general excellence of his work.

Modern Methods of Amputation. By Thomas G. Orr, M.D. of the University of Kansas. 117 pages. St. Louis: C. V. Mosby Co., 1926.

The subject of this monograph tells the story and the story is well told. Pictures, 125 of them, help the text.

Not the least interesting feature is the chapter on cinematiplastic amputations and artificial limb fitting.

Gynecologic Urology. By Lynn L. Fulkerson, M.D. of the New York Post-Graduate Medical School. 247 pages. Philadelphia: B. Blakiston's Son & Co., 1926.

The importance of cystoscopy and endoscopy in the woman is the *raison d'etre* for this book. The author, with painstaking care, has discussed the diseases of the female urological tract, and demonstrated how they can best be treated medically and surgically.

Indeed, Fulkerson has the field of urology in the fair sex quite to himself and he has handled the subject so skillfully as to make this little book a most useful one.

Facts of the Heart. By Richard C. Cabot, M.D., Professor of Medicine and Social Ethics, Harvard University. 781 pages with 163 illustrations. Philadelphia and London: W. B. Saunders Company, 1926.

The study of diseases of the heart which came to necropsy only are set forth in these pages by that shrewd observer and interpreter, Cabot of Boston. He had the help of many men and women and he proclaims the work as a composite of different minds. His, however, is the master mind which collated and correlated the facts and whipped them into an inspirational whole.

One is tempted to give this book the critical review it deserves, but Cabot himself clamps down the lid on such procedure.

In his foreword he advises people not to "try to read the whole book . . . read the opening and closing chapters and the summaries at the end of each section, and then look over as many of the illustrative cases as seem interesting."

It would be *lese majeste* to review a book after that admonition from the high priest himself, but we opine that few readers will take him at his word. They are pretty likely to read the whole works, when they become interested in the subject.

It's not light reading, but it's worth while.

Obstetrics. By Clifford B. Lull, M.D. of Jefferson Medical College. 283 pages. Tenth edition.

Diseases of the Skin. By J. Frank Schamberg, M.D., of the Graduate School of Pennsylvania. 316 pages. Seventh edition. Philadelphia: P. Blakiston's Sons & Co., 1926.

Who of us does not like these familiar, brown covered compends? How much they helped us in preparing for college and state board examinations. How often we sit down and review a subject in which we are interested by their kindly aid. *Multum in parvo* expresses the compend. May they go on until the end of time, becoming better with each succeeding edition. They aid in whiling away an hour by filling us with useful knowledge.

Diseases of the Rectum. By Louis J. Hirschman, M.D. of the Detroit College of Medicine. Cloth, 403 pages. St. Louis: C. V. Mosby Co., 1926.

For the fourth time this book makes its appearance. This edition is practically rewritten and is quite up to the moment.

The importance of local anesthesia as an agent for use in operative work on the rectum is emphasized.

As is to be expected, the subject of rectal diseases has been well covered and the author has, with excellent judgment, laid proper emphasis upon the importance of proctology as a definite specialty.

Physiological Chemistry. By C. J. V. Pettibone, Ph.D. of the University of Minnesota. 404 pages. St. Louis: C. V. Mosby Co., 1925.

The third edition has elaborated with the theoretical and laboratory portions of the original work and has, in consequence, given the student a work of great importance. Medical students, as well as medical men, interested in physiological chemistry, will find within the covers of this book the best there is on the subject.

Ambulant Proctology Clinics. Arranged by C. E. Blanchard, M.D. Youngstown, O.; Medical Success Press, 1925.

This is the report of a clinic held in Youngstown and Mineral Wells, Tex., by the late Dr. J. D. Albright of Philadelphia and Dr. Blanchard. It sets forth their ambulant method of treating proctological conditions. It was demonstrated to classes of physicians gathered in the two cities in June and September, 1925.

Surgery

Treatment of Peptic Ulcer by Physiologic Rest

The surgical treatment of gastric and duodenal ulcers has reached a high state of perfection and is now fairly well standardized in the best clinics. Improvements in the nonsurgical treatment of these ulcers has, however, not kept pace with the advance made in the surgical treatment and many are all too prone to consider that everything possible for the patient is being done if he is given large doses of sodium bicarbonate and a few simple directions as to diet. That this is not true, and that the point of attack should be not only the ulcer but the patient himself, is well brought out by Dr. Frank Smithies, professor of medicine in the University of Illinois, in a paper entitled "A consideration of factors concerned in the production and the healing of peptic ulcer, with a report of the results of treatment of 470 patients by the 'physiologic rest' régime.

In this paper Smithies gives his reasons for adopting the "physiologic rest method of treatment in preference to all others and shows very conclusively that, in his hands at least, the results obtained are sufficiently good to justify its continued use by him and to encourage others to adopt the same method.

In his introduction, the author states that the regimen which he has planned and instituted has been used by him in the treatment of 470 selected cases of peptic ulcer. In 128 of these the ulcers were wholly gastric; in 36, pyloro duodenal; and in 306 cases, duodenal. The patients were observed between 1914 and 1924, but the present study does not include those treated between 1922 and 1924 because the writer considers two years as insufficient time in which to establish indisputable proof of results. Nor are 302 patients who were regarded as subjects for surgical care included.

Smithies writes that—

A special ulcer regimen was gradually evolved in my clinic, partly because the accumulating new facts in the field of digestive ailments demanded a readjustment of our ideas with respect to both diagnosis and treatment, but, mainly, on account of the steady stream of ulcer "recurrences" (our own cases and those of others) which appeared following more or less lengthy seances of management instituted on the old lines suggested years since by Leube, Lenhartz, Stewart, Fenwick, Ewald, or by recent regimens, of essentially like type, revamped under numerous names. Unbiased analysis of the failures ("recurrences," "complications," etc.) compelled the admission that so-called "standard" methods of peptic-ulcer treatment (particularly the non-surgical) implied a narrow, ancient, and unscientific conception of ulcer etiology, incidence, pathology, life history, clinical syndrome or possible complications, and that therapeutic management, medicinally and dietetically, was unjustifiedly empiric, giving little or no consideration to well-established facts connected with the interference of gastric physiology, chemistry, and digestive function brought about by ulcer occurrence.

Attention is called to the fact that although physicians are agreed that peptic ulcer is a local affection which results from extremely varied systemic disturbances, treatment has consisted entirely of attempts to heal the local lesion, and has been the same in all cases.

Data relative to cure of ulcer by "standard" methods of treatment are, according to Smithies, "especially bewildering and unconvincing" because of the liability to error in diagnosis and because, in many cases, "relief of subjective symptoms is recorded as ulcer cure." Various writers are quoted to show the difficulty of knowing that an ulcer is healed. Lemon summarized the experience of the Mayo clinic with the "Sippy regimen" by stating that "since the surgical examination of these cases has proved that they heal spontaneously only in rare instances, the disadvantages in such routine treatment (Sippy regimen) are manifest. After a period of serious symptoms, lasting for some weeks, the patient with duodenal ulcer may have complete relief and, yet, if operated on during the quiescent period, the ulcer will almost regularly be found open and unhealed. At operations performed in many cases within only a few weeks of the completion of a rigid, medical management, and at operations performed during the remission of symptoms, an active ulcer was found. The remission in the latter case represents the normal resting stage; in the former, it is artificially produced. The supposed cures of chronic ulcers of the stomach and duodenum (by nonsurgical procedures) may be compared with the supposed cures following each attack of recurring appendicitis or gallstone disease."

Figures representing the percentage of cures resulting from various methods of nonsurgical treatment of peptic ulcers have been given from time to time, but these are not considered by Smithies as being based upon sufficiently accurate information to render them of great value.

Percentages of cure by surgical procedures are very encouraging, but Smithies, in a study of 273 cases following gastro-enterostomy, found only 20.9 per cent "complaint free," 49.8 per cent were "clinically comfortable," and 38 per cent were "im-

proved." In all, "88 per cent were benefited subjectively by operation, and of this number approximately 70 per cent received permanent benefit."

Smithies considers that the management of these cases leaves much to be desired, and that the "time has now arrived for an attempt toward investigating what may be termed 'pre-ulcer pathology.'"

Prevention of ulcer is the ideal for which the author is striving. To reach this ideal " * * * every ulcer, definitely known to exist to-day, should be carefully and exhaustitvely studied, not only from the standpoint of its clinical manifestations, its pathology and its interference with gastric function, but also with regard to the previous ailments or conditions in the individual which have contributed to a constitutional or a local visceral status permitting ulcer eventually to develop. This field is a fruitful one; a few decades hence, probably, it will be considered an indication of poor medical practice if in a community, great numbers of peptic ulcers exist. Much of the ulcer cure is intimately concerned with the subject of ulcer etiology."

The common conception of peptic ulcer, even to-day, is that of "acid corrosion." This has led to all treatment being directed toward overcoming acidity and a neglect of the search for the *primary* cause. Smithies says: " * * * It is sufficient to state that fully *97 per cent of all peptic ulcers arise not primarily in the viscera,* but they represent *secondary visceral lesions produced as a consequence of a pre-ulcerous systemic disturbance.*" The reasons given for this fact are that "the ulcer-bearing areas in the stomach and in the duodenum are, anatomically, particularly susceptible to systemic disturbances on account of the inherent peculiarities of their arterial blood supply. * * * In the ulcer-bearing areas of the stomach and duodenum, the arteries of the submucosa relatively are sparsely distributed; they are tortuous, anastamose infrequently and are subject to powerful and repeated constrictions by numerous, interlacing, intricate, frequently contracting muscle-bundles. * * * Added to this anatomic evidence that the ulcer-bearing areas are poorly equipped from the circulatory side, we have the valuable contribution of C. G. Heyd. He has demonstrated a close, lymphatic inter-relationship existing between the appendix cecuc, bilary tract, the pylorus and the antrum. * * * When these studies are appreciated, it will be readily understood how it is possible for ulcer-producing agents, arising far from the ulcer-bearing areas, to cause and maintain those peculiar, local, visceral conditions the end result of which is peptic ulcer."

Smithies divides the mechanism leading to ulcer formation into two main types:

1. Interference with the blood supply to the pyloric third of the stomach and the first fourth of the duodenum, due to (a) bacterial emboli, (b) arteriole and capillary endarteritis or sclerosis, (c) arteriole and capillary spasms, (d) vascular stricture, and (e) arterial or venous rupture. These may be brought about in various ways, but the end result in the same—an upset in the chemical balance which has prevented the proteolytic action of free hydrochloric acid and pepsin. " * * * It matters not whether hydrochloric acid is of high or of low concentration; so long as the trial, devitalized protin, HCL and pepsin is present, proteolysis occurs. The ulcer size, its form, penetration and the resultant complications (as hemorrhage and perforation) directly depend upon the depth, from the mucosa into the stomach wall, at which complete vascular blocking ceases. In a general way, the visceral damage is self-limited in extent and can not be prophesied."

2. Infection carried by the lymph-stream draining from the appendix area and biliary tract probably results in many ulcers becoming secondarily infected.

In discussing the physiology of the stomach, the author shows that in ulcer cases it is not necessary for the gastric chemistry to be altered, that the ulcer is not caused by an increased acidity, and that the ulcer does not bring about an alteration of acidity. Study has shown that the range of strength of normal gastric acid carries it well beyond the strength found in gastric ulcer, and that the pain of gastric ulcer is not due to irritation of inflamed mucous surfaces by gastric juice rich in hydrochloric acid and pepsin. Various observers have shown that pain is not commonly present when gastric acidity is highest. " * * * The relief from pain in gastric ulcer cases is quite as prompt when alkalies are administered in low acid cases, as when such are used in high acid cases. Prompt relief of pain is also secured by the exhibition of nonalkaline agents, e. g., lavage, antispasmodics, alcohol, opiates, diet, etc. It would seem, therefore, that treatment of peptic ulcer based upon the theory of abnormal gastric chemism alone rests upon no scientific foundation but is empirical."

The mechanical factors concerned with digestion are, according to Smithies, "of greater importance than are variations in the acid and pepsin secretory function." Food delay in the antrum, where 60 per cent of gastric ulcers are found, " * * * permits of increased local movements of the viscus, greater opportunity for food and acid to remain in intimate contact with injured gastric lining; hence, opportunity for the maximum of trauma of infection, of digestion of damaged tissue, of stress upon the pyloric sphincter and for local alterations in circulatory and neuromuscular mechanism."

Smithies considers that these facts "furnish a logical groundwork upon which to plan the treatment of peptic ulcer," and is convinced, after more than 10 years' observation, "of the practicability and worth of the clinical application of physiologically proved principles. * * *"

The treatment adopted by the writer is based upon the facts already stated and is entirely rational. First of all, he searches for the primary etiological fault. Having found this, he attempts to eradicate or alleviate it. This he does by treating the patient as well as the ulcer, and finds that—provided complications such as stenosis, deformity, or malignancy do not exist, and accidents, such as hemorrhage or perforation do not occur—natural, orderly healing will take place.

Finding the primary cause is not always easy, and Smithies mentions many parts of the body in which it must be sought. "Inasmuch as primary foci of infection may exist in oral adenoid tissue head sinuses, about teeth or in systemic lymph-gland chains, these must be energetically attacked. Intra-abdominal infectious strongholds likewise must be eradicated, *e. g.,* diseased appendix, gall bladder, Fallopian tubes, ovaries, ulcers or subinfections of the bowel." The removal of these foci is of great importance. Doing away with the supply of bacteria allows healing. The patient must be examined for "cardiac leakages, myocardial insufficiency, capillary sclerosis, anemia, evidences of occupational poisoning, endocrine dysfunction improper environment, overwork, or nervous stress." Any of these may lead to or aggravate ulcers. At least two Wassermann tests should be made.

In certain cases, nonsurgical treatment will not result in cure for, as Smithies says, "After local foci of infection have been removed, and constitutional or environmental corrections arranged, the choice of treatment is further influenced by the type and position of the ulcer. Unless ulcers which are complicated by much scarring or which produce great gastric or duodenal deformity are demonstrated to be luetic, little hope of permanent relief by medical regimens can be offered. Surgry promises the greatest prospect of relief to such cases. So-called 'obstructive' ulcers which are claimed to be cured by nonsurgical treatment are not true scar obstructions but only powerful local gastric spasms. Scar tissue is an end pathologic process; if non-leutic, it yields to no known drugs. Intense pain, frequent hemorrhage, perforation or the danger of malignant change taking place in calloused gastric ulcers likewise contraindicate non-operative care. Unfortunately, we have no clinical or laboratory tests which indicate to us what type of gastric ulcers will become malignant or when early malignant change in taking place. However, we can be consoled by knowing that malignancy in connection with duodenal ulcer is rare. the Rontgen demonstration of calloused gastric ulcer exceeding 2 cm. diameter, when such is associated with history of frequently recurring ulcer symptoms, and the positive chemical test for blood *constantly* determined in the stools, form a clinical hint for malignancy which can not be disregarded. The most competent clinicians are agreed that calloused, recurring ulcers located in the pyloric end of the stomach should be treated operatively. Excision of all gastric callouses should be performed, when mechanically possible, wherever they may be located. If excision is impractical, then infolding or cautery puncture, with or without gastrojejunostomy, yields the most satisfactory results. In nonobstructing ulcers, it would seem that gastrojejunostomy should always be accompanied by permanent pyloric closure if one is to secure a perfect and permanently emptying stoma. I see no logical reason for the shock-producing extensive gastric resections advocated by Finsterer."

In other words, careful selection must be made of cases which are to receive nonsurgical treatment, if success is to be expected.

The four principles underlying treatment of peptic ulcers are given as follows:

1. The recognition that such ulcer is not a primary gastric or duodenal ailment.
2. Recognition of the type of ulcer.
3. Gastric chemistry plays a comparatively insignificent rôle.
4. Give the injured part physiological rest and do not interfere with natural healing.

This is simply adopting the principle used in all surgical work and applying it to nonsurgical treatment.

The administration of excessive amounts of alkalies is often followed by toxic symptoms and there is no proof that it results in a permanent reduction of gastric acidity.

The medicines used by Smithies are not administered with any idea that they promote healing of the ulcer, but are given to relieve discomfort due to (1) painful gastrospasms, (2) accumulation of overacid gastric contents associated with peristaltic unrest, or (3) pain associated with perforation or ulcer progression.

Painful gastrospasms are controlled by diet; in some cases, atropine, tincture of belladonna, or bromides are used. Occasionally, orthoform, in 10-grain doses, is given.

For the relief of overacid gastric secretions, sodium bicarbonate is contraindicated because such large quantities are necessary that excessive gastric secretion is brought about and toxic symptoms are liable to follow. If alkalies are used, frequent small doses of milk of magnesia or solutions of calcined magnesia are preferred. Smithies rarely uses alkalies and only occasionally does he employ gastric lavage.

The pains of perforation or ulcer extensions are controlled by keeping the stomach empty, by giving morphine, by rest in bed, and by hot compresses to the abdomen.

Hemorrhage is, of course, an indication for early operative intervention.

The advantages claimed by Smithies for his method of treatment are many and his results have been excellent. As he says, his results are probably better than would be those of some one less experienced in the use of this method. The treatment is not difficult, however, and should be given a thorough trial.

Smithies found that, in his hospital cases, the average stay in hospital was only 26 days and the stay in bed, less than 9 days. All pain had disappeared in 40 per cent of patients within 24 hours; an addition 33 per cent were relieved in 48 hours; 8 per cent required 72 hours; 15 per cent, almost 96 hours. In only 4 per cent was it necessary to use opiates.

The subjective distress—ordinarily attributed to excessive gastric secretion, but which Smithies considers as being due to excessive motility—is relieved by the physiologic rest which produces visceral relaxation.

Of 41 per cent of Smithies' cases which showed occult blood, 92 per cent were blood free at the end of five days.

Seven of the 470 cases of the series went on to perforation. These were poor surgical risks upon entrance to the hospital, otherwise they would have been given the benefit of early surgical intervention.

As proof of healing, Smithies states that 66 of the ulcer patients came to laparotomy for numerous intra-abdominal lesions, after treatment was completed, and that in 54 of these (82 per cent) completely healed scars were found. Röntgen proof of healing was shown in 94 cases.

In the patients who had recurrence of symptoms, the time interval between attacks was, in one group, increased to an average of 30 months from a previous average of five months. Other groups showed intervals of 37 and 44 months.

For the whole series of 470 cases, recurrence was noted in 14 per cent (66 cases), while claim of cessation of the ulcer process seems justified in 77 per cent (361 cases).

These results compare very favorably with the results of surgical treatment and are superior to those of other forms of nonsurgical treatment. Should this method be generally adopted, it seems probably that many sufferers from peptic ulcer would be spared the ordeal of a major surgical operation and have a better chance for permanent relief than they now have with the methods in more general use.—(*U. S. Nav. Bull.*, July, 1926.)

The Prevalence of Intrathoracic Tumors

Are new growths in the chest on the increase? The recent discussion at the Royal Society of Medicine on intrathoracic new growths has raised a question by no means uncommon amongst present-day problems of medicine. After the statistician has made his necessary corrections of the crude death-rate we are still faced with the possibility that improved methods of diagnosis, greater facilities for post-mortem examinations, and improved technique in laboratory examinations of all descriptions may bring a particular disease into greater prominence than it has previously attained. Even the historial approach is not without its pitfalls. The morbid anatomists of the first half of the nineteenth century were remarkably acute observers and doubtless missed very little that the unaided eye was capable of teaching them; but they labored under great disadvantages, and we have only to try and visualize a pathological department without a microscope —especially without an oil-immersion lens—to realize how great were their handicaps. Although the morbid anatomist of a previous generation failed to record intrathoracic tumors in any considerable numbers, we cannot be sure that such tumors were, in consequence, actually rare The question would appear, at present, to be unanswerable; there are too many unknown quantities in the equation.

The relative proportions in which the different varieties of these intrathoracic tumors occur is perhaps a less difficult question, but even here English, Continental, and American statistics, will be found to differ. Setting aside benign tumors, the commonest form of primary malignant tumors within the thorax is, in English statistics, sarcoma of the mediastinum, whilst malignant growths of the pleura are the rarest, and carcinoma of the lung occurs in an intermediate position.

Dr. J. S. Grove and S. E. Kramer, (*Amer. Jour. of Med. Sci.*, 1926, clxxi., 250), have recently shown that carcinoma of the lung is by no means a rare disease. They state from an extensive survey of the literature that this disease is found in 0.15 per cent or more of all autopsies, that about 1 per cent of all carcinomata are pulmonary, and that the disease forms 2 per cent of all deaths from pulmonary disease. There appears, further, to be some evidence that this increase in pulmonary new growths has been coincident with the recent epidemic of influenza.

The authors also quote facts which throw doubt on the old Schneeberg statistics for carcinoma of the lung. The figures given by Harting and Hesse in 1878 showed that 79 per cent of all deaths amongst the miners of the Schneeberg district of Saxony were due to this disease. These returns were, however, not adequately checked by post-mortem examinations, and more recent research has shown the probability that both pneumonokoniosis and tuberculosis were responsible for many of the so-called carcinoma deaths. Research work in other quarters seems to indicate that the older authorities not infrequently confused pneumonokoniosis with new growth. Indeed, the whole question of interpreting the older sets of figures is uncommonly difficult. Obviously differential diagnosis is of peculiar importance in this disease, and it would be safe to say that more rapid strides have been made on this aspect of the subject than on any other. Radiology has doubtless played an important part in this advance. Radiograms of the chest increase in diagnostic value year by year, and the recent introduction of lipiodol has added yet another weapon to the armament of the radiologist.

In his introduction to the discussion at the Royal Society of Medicine, Dr. L. S. T. Burrell stressed also, amongst other diagnostic points, the importance of the absence of tubercle bacilli in the sputum. We are too apt to assume that a negative sputum test means nothing, whereas in point of fact it may mean a good deal. Yet another common pitfall is the Wassermann reaction. More than once it has been our experience to see a diagnosis of malignant tumor of the thorax withdrawn on receipt of a positive Wassermann reaction report, only to find at the autopsy that malignant intrathoracic tumor was the correct diagnosis. The possibility of confusion with aneurysm is obvious, but, after all, there is no reason why a patient with malignant disease should not have previously had veneral disease; indeed, it is possible that syphilis may be a predisposing cause of malignant lung, as it is of certain other forms of malignant disease. If, therefore, there are good grounds for the diagnosis of the malignant intrathoracic growth, a positive Wassermann test need not necessarily engender doubts of the original diagnosis. Pyrexia and night sweats, too, are frequently misleading signs. All intrathoracic growths sooner or later become septic from retained secretion and not infrequently this complication may effectively obscure the true picture.

The association of pulmonary tuberculosis with carcinoma of the lung was emphasized by Dr. Burrell in the recent discussion; it constitutes yet another pitfall. Finally, pleural effusion repeatedly recurring after tapping may mask the usual signs of growths. The difficulties of differential diagnosis are, therefore, many and various, and it is small wonder if, in the absence of the newer aids to diagnosis, these cases are sometimes wrongly diagnosed. The importance of early diagnosis was emphasized by more than one speaker during the discussion. To wait until unequivocal signs of pressure clinch the diagnosis is to wait until all possibility of surgical aid is past. This disease or group of diseases is, in short, a typical example of the value of the modern method of team work. Laryngologist, pathologist, radiologist, and surgeon can all assist the physician and none of them can be safely omitted from the team.

The histological features of malignant intrathoracic growths offer much scope or research, and attention having been called to the existence of this fund of material it is likely that, in the near future, more results of pathological investigation will be forthcoming. Thus the group of tumors at present designated sarcoma of the mediastinum offers an especially interest opportunity for research. By reason of their pressure symptoms they are perhaps more commonly diagnosed during life than are the pulmonary carcinomata, and clinically they form a clearly defined group. From the pathologist's point of view, however, they raise all manner of difficult questions.

The histological picture is peculiar, so much so that some pathologists are disinclined to admit that they are true sarcomata. The predilection of these tumors for the middle mediastinal group of glands, the two well-defined paths of extension by the deep and superficial lymphatics of the lung causing markedly different pathological pictures, and the liability to track down the

walls of the superior vena cava into the right heart, all add to the diversity of the situation. The pulmonary carcinomata vary in naked-eye appearance to such an extent that it is frequently impossible to decide upon their true nature without careful histological examination.

Drs. Grove and Kramer enumerate five different varieties—viz., infiltrating, multiple nodular, solitary modular, miliary, and mixed—with a histological picture of cylinder-celled, squamous, or mixed-cell type. Of these, the miliary is admittedly the most difficult to recognize naked-eye, being liable to be confused at first sight with tuberculosis. The point of origin of these tumors is obscure, and this obscurity is rendered greater by the fact that the specimens are not usually obtained early from the operating theatre, but at the end of the course of the disease, from the post-mortem room, when sequelae and complications have obscured the picture. There would appear, however, to be some evidence for believing that the majority of these tumors arise from the bronchial mucous membrane. One point worthy of special mention is their not infrequent symbiosis with tuberculosis. In some quarters this symbiosis has been adduced as evidence for the view that tuberculosis is a predisposing cause of carcinoma.

There are, however, two other possible explanations—viz., (1) the tubercle bacillus may be a terminal infection as it so frequently is in lymph-adenoma, or (2) that carcinoma growing in a lung may readily light up a quiescent tuberculous focus. At any rate, with the extreme liability of the lung to become infected with tuberculosis, it is not surprising that *B. tuberculosis* should be found in association with any other pulmonary lesion. Little can be said concerning the etiology of these malignant intrathoracic growths. The evidence of the arsenic and cobalt miners of Schneeberg, the suggested relationship between pulmonary carcinoma and the recent influenza epidemics, the after-effects of war gases, and the modern pracitce of tarring roads, all seem too vague and indefinite to be reckoned with as directly causative factors.

There remains the question of benign intrathoracic growths. Here, again, is a subject for research. Hitherto these cases have been described almost as curiosities; very little is known concerning them, and not being directly fatal they only rarely reach the post-mortem table. Routine radiological examinations of the chest in hospital patients would soon elicit the needed facts as to the prevalence and character of this hitherto little recognized group of diseases.—(*Lancet*, March 13, 1926.)

Foreign Bodies in the Lung

The practical creation of the art, and well may it be called, of bronchoscopy, its application to the diagnosis of pathologic conditions of the respiratory tract, and its efficiency as an aid in the removal of growths, of foreign bodies, and in securing drainage properly can be accredited to Chevalier Jackson, whose world-wide reputation has been abundantly justified not only by his extraordinary success, but by the fact that these manipulations, of which he is easily the master, are being practiced, and with his instruments, by many others.

Success in this field of surgical endeavor has been so brilliant as to somewhat obscure the progress made by surgeons for the removal of foreign bodies embedded in lung tissue and not accessible through the bronchial tree. Such success has been particularly noteworthy in the hands of Dr. Petit de la Villeon, who wrote to Dr. J. J. Buchanan (*Annals of Surgery*, January, 1925) in the early part of 1925: "By my method, more than 1,000 intrapulmonary projectiles have been extracted by myself and my friends with a mortality of five patients (½ of 1 per cent). The method is classic today in France. It is adopted by the great majority of surgeons because of its certainty, its safety, its simplicity, and its efficiency."

De la Villeon's method is termed "the buttonhole" operation. Through such an incision, and guided by the fluoroscope, he pushes a blunt pair of forceps through the pleura and lung tissue to the foreign body, which is seized and withdrawn. When projectlies are located at the root of the lung and in the region of the hilum he does not advocate this procedure.

Lefort notes that even after considerable groping in the lung tissue the patient experiences little reaction and may soon walk about; within two days. Duval in a personal letter to Buchanan notes he has removed 80 projectiles from the lungs by his own method, with one death from double bronchopneumonia. Marion reported 153 patients operated on by rib resection, anchoring of the lung to the parietal pleura, incising to the foreign body, and removing it by forceps. There were four deaths.

Buchanan reports on a case of his own shot in Russia in 1920, with the lodgment of a bullet under the third rib and second interspace about 1½ inches from the left border of the sternum, and at a depth of three inches from the anterior chest wall. Chevalier Jackson believed that the removal of this missile by bronchoscopy would be a dangerous procedure because of its location so close to the large vessels. Buchanan resected 2½ inches of the third rib overlying the bullet and packed the wound. The next day under cocaine four catgut sutures were inserted, suturing the lung to the parietal pleura. The lung was incised, and the bullet was located by needle passed in about 2½ inches. There was some air aspirated and an irritative cough occurred, the patient expectorating some blood. Aspiration was stopped and the wound was lightly packed. Two days later, without anesthesia, the ball was again located. Adhesion of the pleural layers by this time was complete. Contact with the ball was again made with a needle and the track of the needle enlarged with a bistoury. The finger was then passed to the projectile and acted as a guide to the bullet forceps, which removed the missile. There was fairly free bleeding, which quickly ceased. The external wound was lightly packed with iodoform gauze, no sutures being used. Convalescence was uneventful.

From current literature it would seem that operations for removal of foreign bodies from the lungs are no more frequent now than they were before the war, although a definite method for both location and removal has been set forth. The mortality under proper procedure and in skilled hands seems astonishingly low.—(*Ther. Gaz.*)

Newer Methods of Preliminary Medication

An ordinary dose of morphin (⅛ to ¼ grain) does not completely remove psychic impulses says James T. Gwathmey and Chas. W. Hooper. Patients receiving a preliminary dose of morphin show a rise of blood pressure of from 10 to 40 mm. systolic ordinarily, and, occasionally, up to 80 and 90 mm. just prior to the administration of the anesthetic. It is therefore obvious that patients are better protected from physic shock and actual physical pain with a form of preliminary medication that will render them indifferent to their surroundings. This medication should precede all forms of anesthesia either local or general. It means the difference between safe and unsafe inhalation anesthesia, between guess work and certainty, and sometimes the difference between life and death.

Two hours before operation intramuscular injection of 2 cc. sterile 50 per cent solution magnesium sulphate combined with 2½ per cent novocain and ⅛ grain morphin sulphate should be given. Repeat once or twice at thirty minute intervals. For alcoholics and athletes, in addition to the above preliminary medication, the following rectal instillation may be given 40 minutes before operation: Ether 2½ oz.; paraldehyde 2 drams; olive oil q.s.ad 4 oz. With this small amount of ether per rectum, full surgical anesthesia with relaxed tongue does not occur. It can be given with full assurance as to its safety. Nausea and vomiting does not occur as when either is given by inhalation. In conclusion the authors state that whenever morphin is indicated, it should be used with novocain and magnesium sulphate intramuscularly.—(*Proc. Inter-State Post Grad. Med. Assem. N. Amer.*, pp. 88-94.)

Action of Anesthetics on the Cornea

The depth and the duration of anesthesia are greater with stronger solutions, says E. Marx, but there is no proportionality between the former and the latter. The minimum concentration of cocaine which gave any anesthesia was 0.125 per cent., and its duration was about 10 minutes. By taking the efficiency of this strength of cocaine as 1, the relative effectiveness of other strengths of cocaine and of holocain was found to be: cocaine 1 per cent 6.5, and 2 per cent 9.0; holocain 1 per cent 5.8.—(*Arch. Neer. Phys.*, 9,539-57.)

Transsacral Block Ideal for Suprapubic Prostatectomy

Lanning E. Likes believes that in order to avoid toxic effect a freshly prepared isotonic solution of 0.25 per cent procain (American novocain) with synthetic suprarenin should be used. Preparation of the patients is the same as for general anesthesia. Preliminary injections of morphin are a great aid in work under local anesthesia. The details of technic which are so important are described. The author follows closely the method described by Sherwood-Dunn. Under local anesthesia it is not necessary to starve the patients beforehand, and in debilitated subjects this is a great advantage. Post-narcosis disturbance of the alimentary canal is not present. Undoubtedly post-operative vomiting has been responsible for hernias. Many patients survive an operation but die from metabolic interruption. The severe pains in the back often complained of after general anesthesia are due to complete relaxation of the ligaments supporting the vertebral column. This is avoided with local anesthesia. On the whole, our results have been more pleasing than with general anesthesia, and equally as satisfactory.—(*Am. J. Surg.*, May, 1926.)